

# Tempestade Subtropical Yakecan

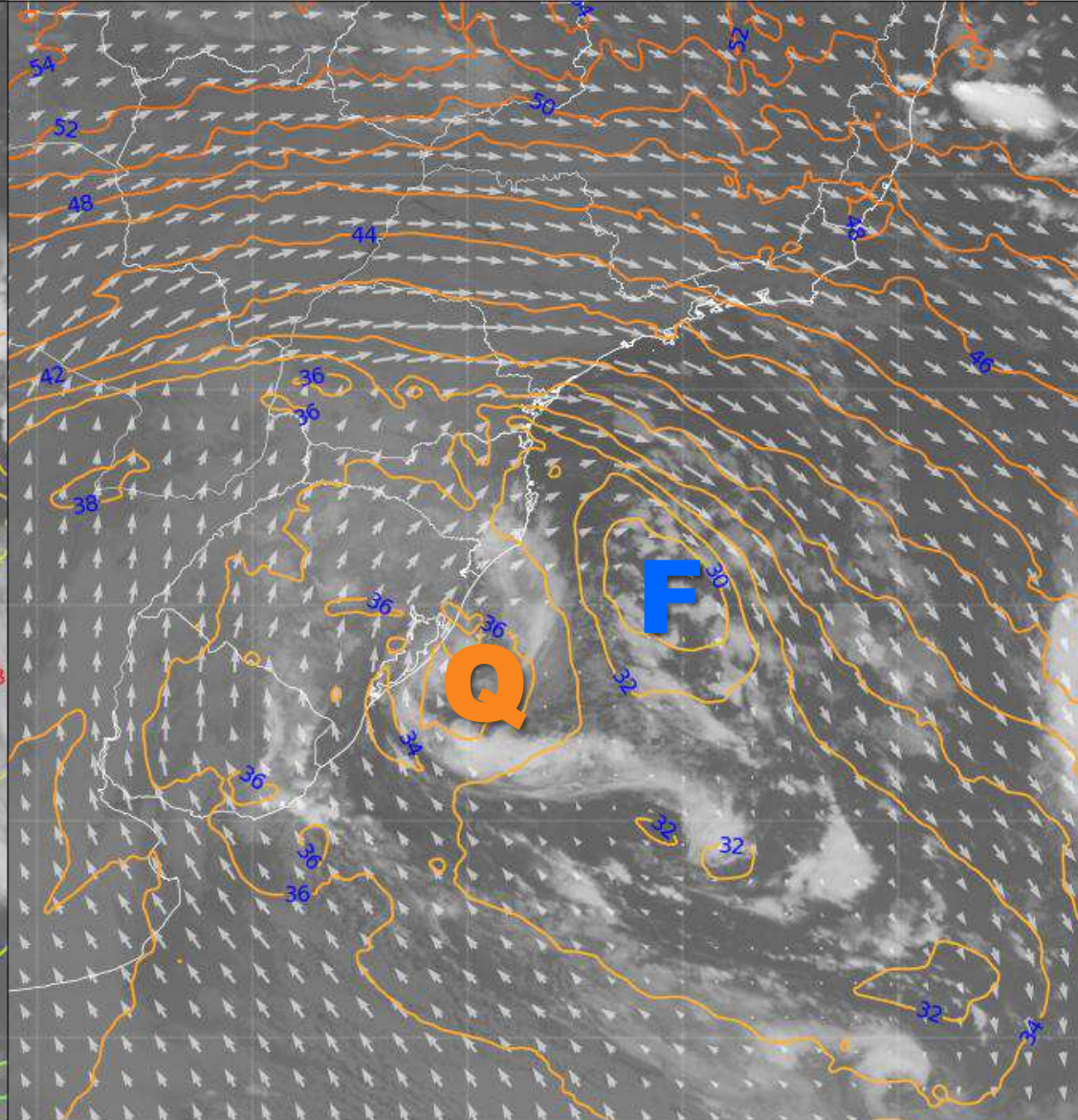
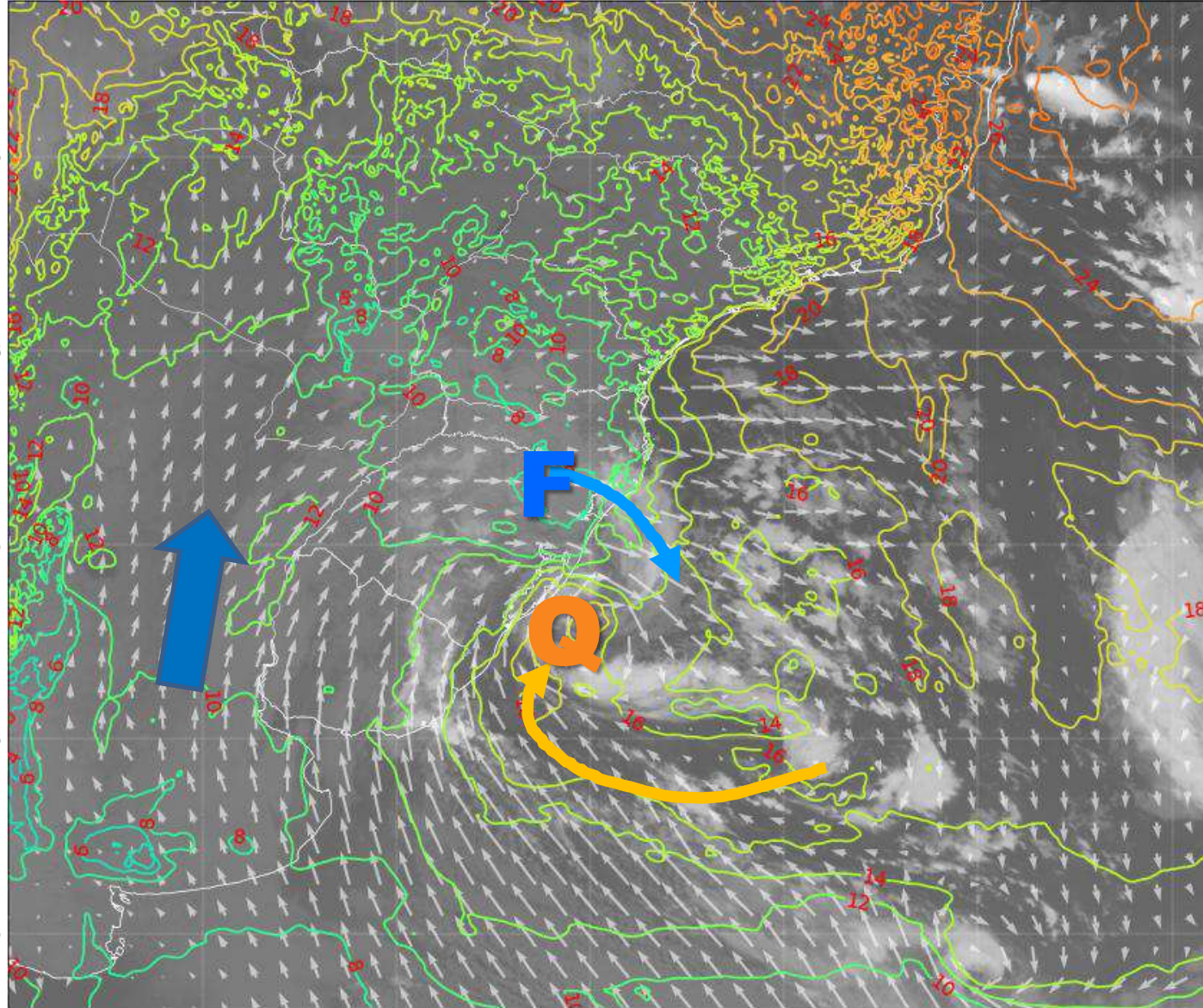
GOES-Leste

ABI IR-10.35µm ch.13 WRF Temp.Pot.camadas

GOES-Leste ABI IR10.35 2022-05-18 00:00UTC, WRF Potential Temperature + wind (1000hPa)

GOES-Leste ABI IR10.35 2022-05-18 00:00UTC, WRF Potential Temperature + wind (500hPa)

Reg.: [-65.0, -42.0, -34.0]



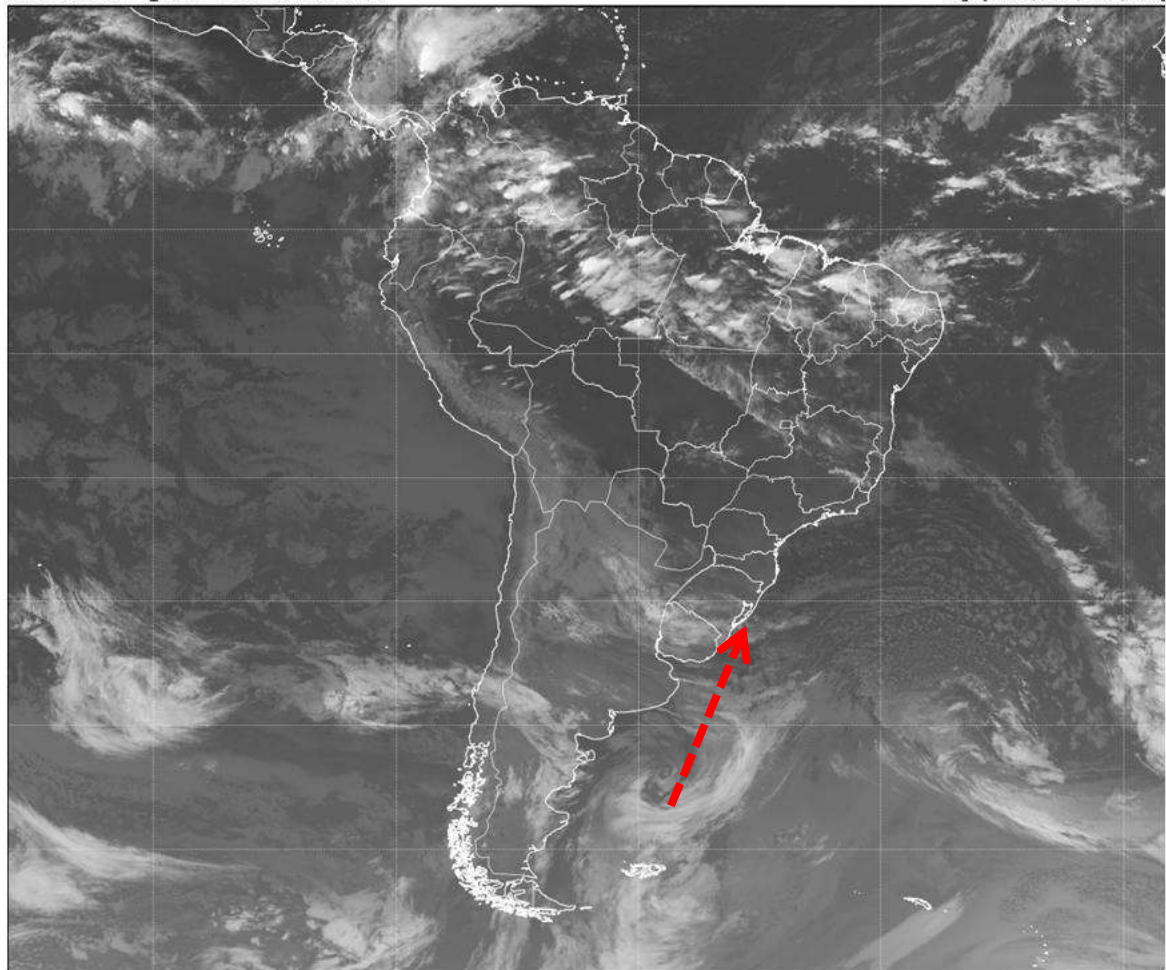
Levels:  
500 hPa  
700 hPa  
850 hPa  
1000 hPa

Levels:  
500 hPa  
700 hPa  
850 hPa  
1000 hPa

# Tempestade Subtropical Yakecan

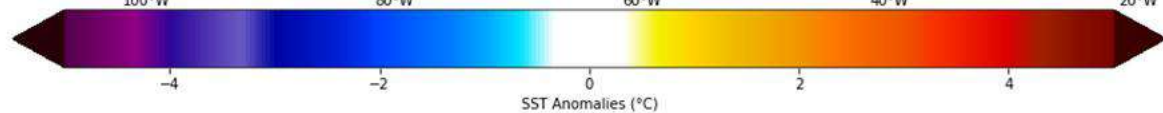
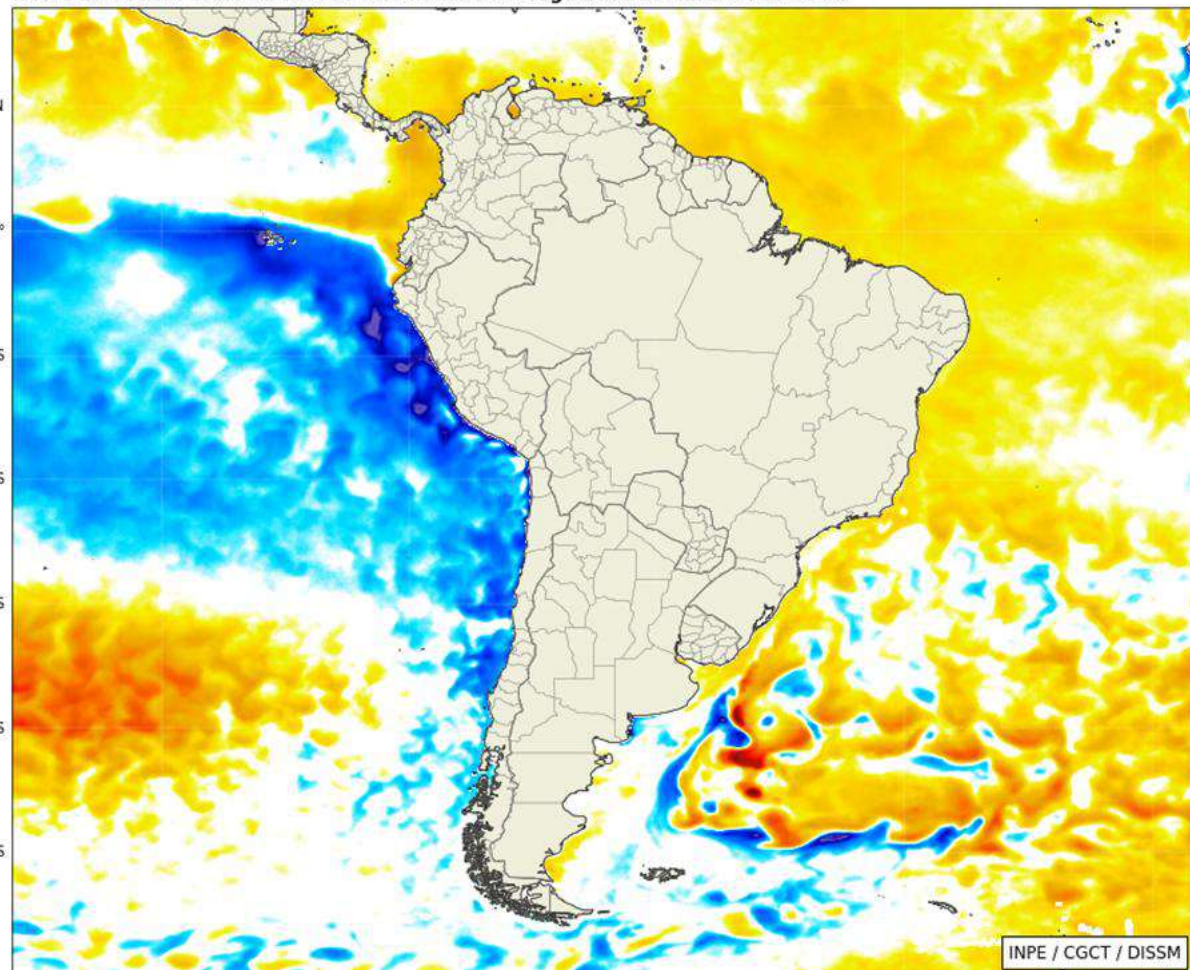
GOES-Leste ABI IR-10.35 $\mu$ m ch.13

GOES-Leste ABI IR\_10.35 2022-05-14 00:00 UTC Reg.: [-112.0, -60.0, -16.5, 18.0]



NOAA SST-A : 01-15/05/2022

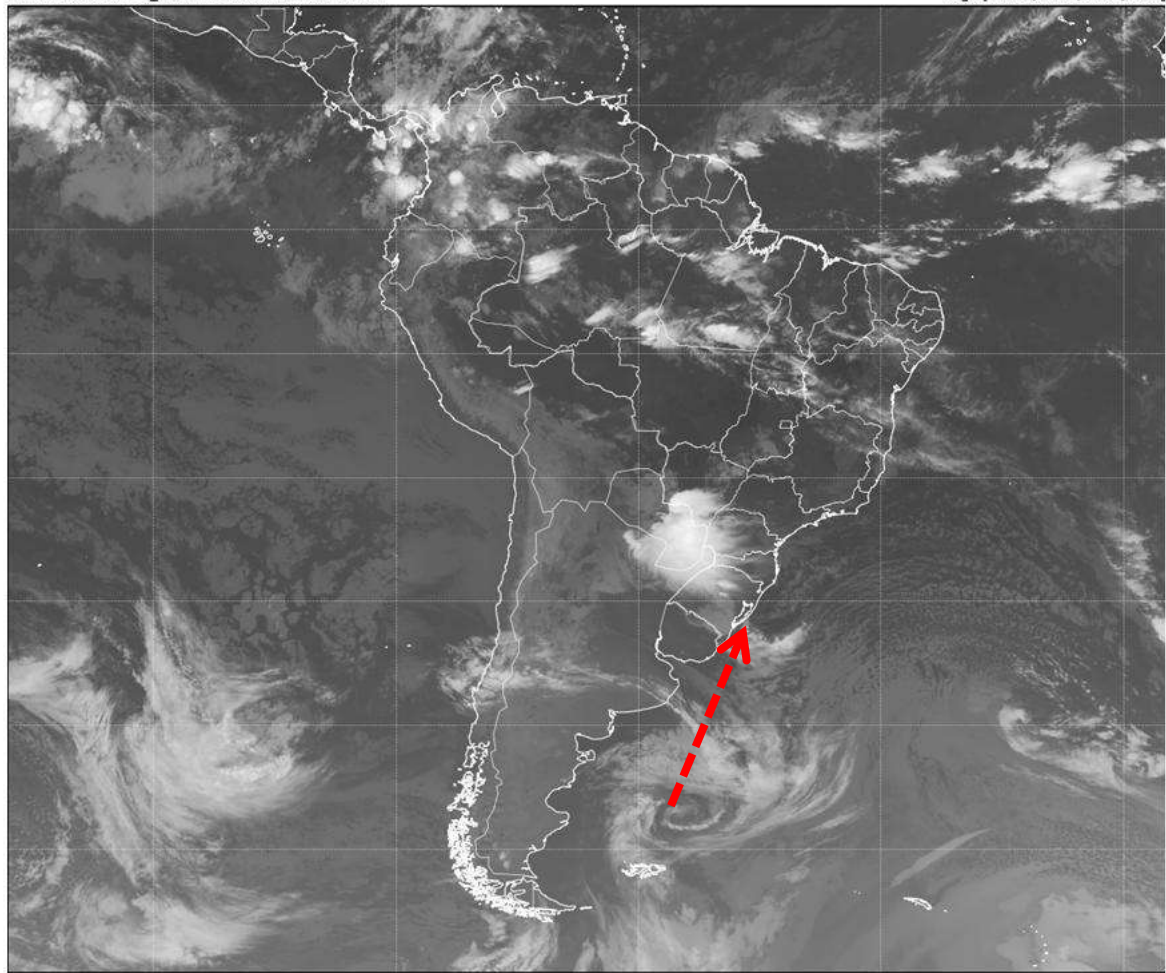
NOAA Coral Reef Watch 5 km SST Anomalies - Average 2022-05-01 to 2022-05-15



# Tempestade Subtropical Yakecan

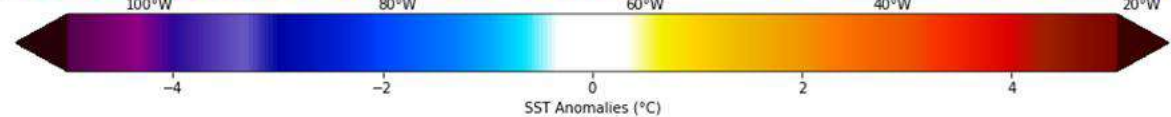
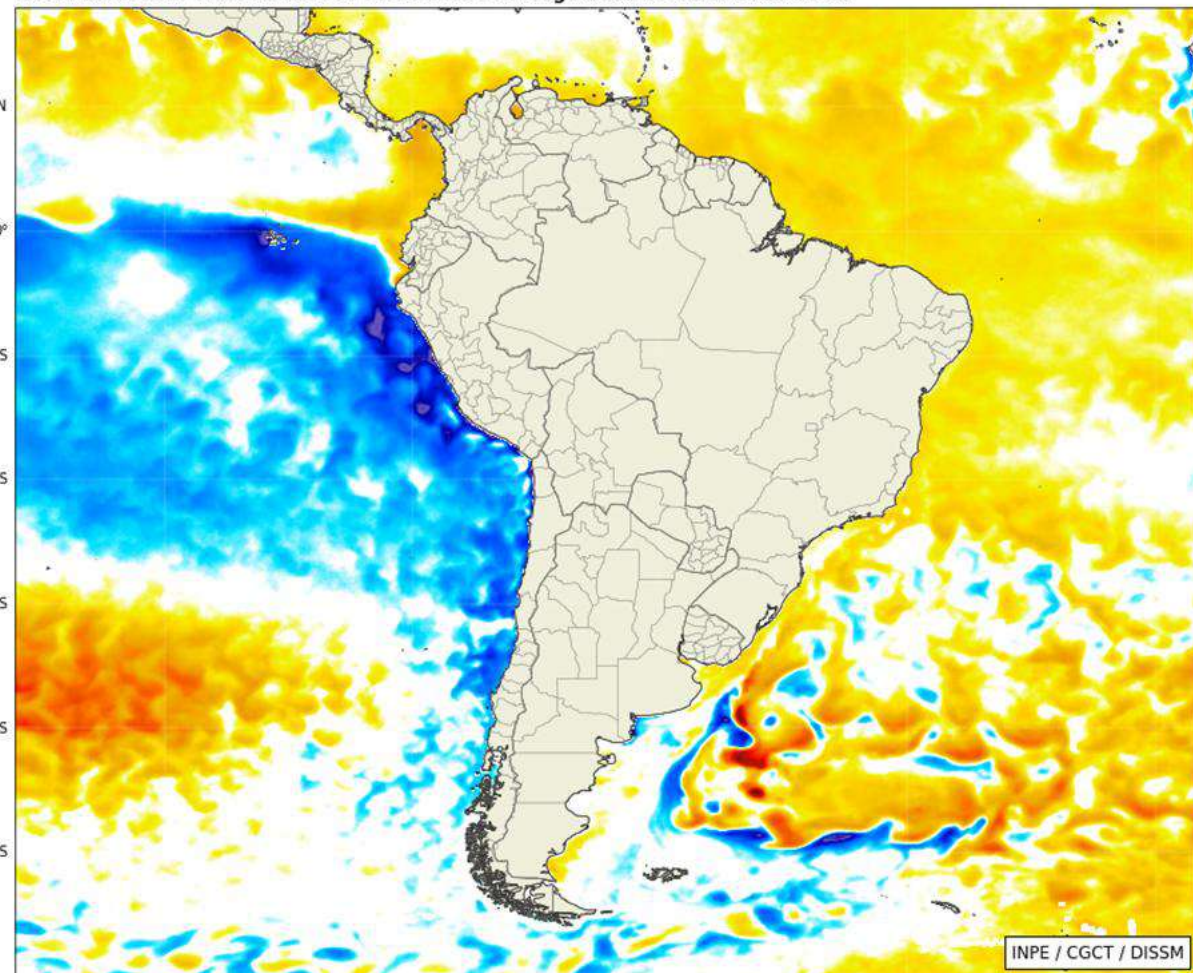
GOES-Leste ABI IR-10.35 $\mu$ m ch.13

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NOAA SST-A : 01-15/05/2022

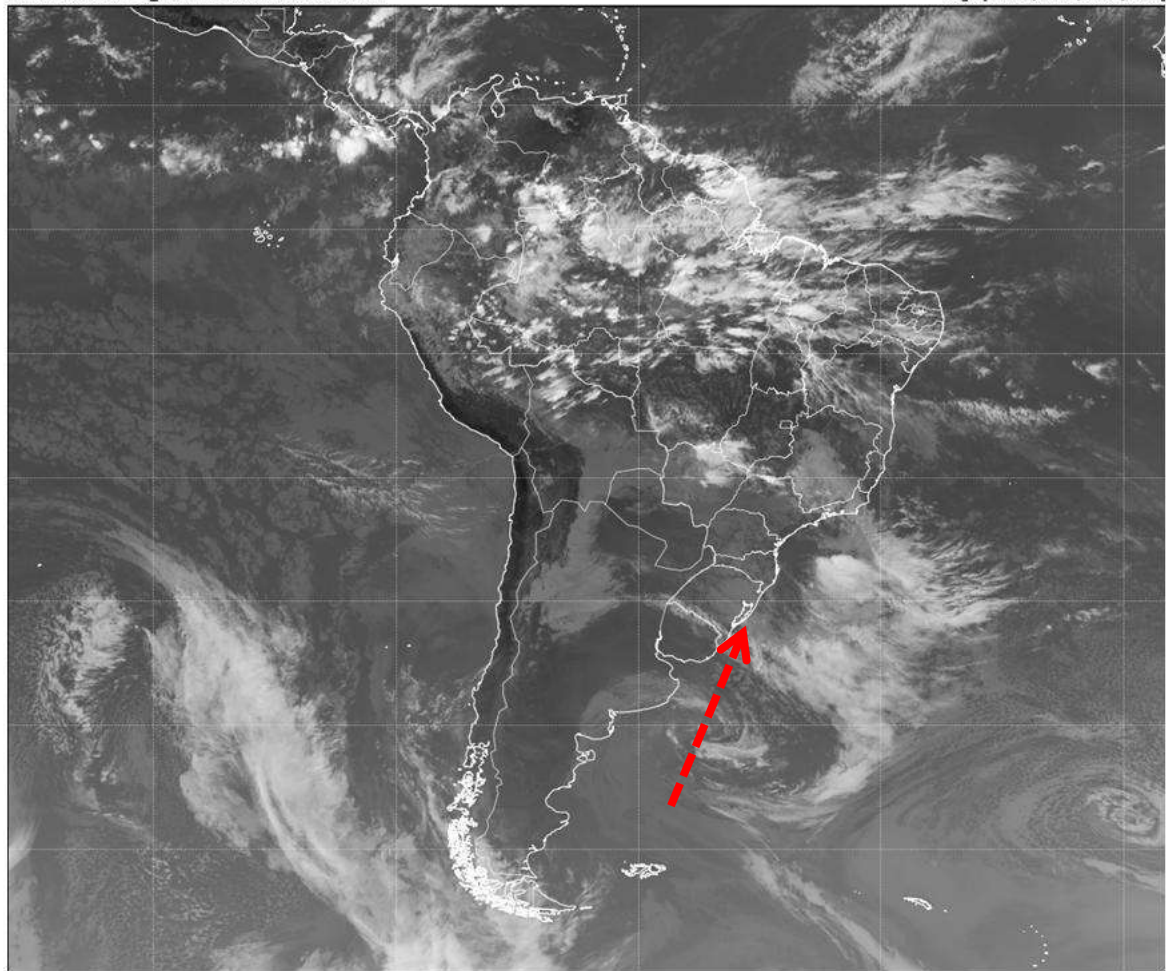
NOAA Coral Reef Watch 5 km SST Anomalies - Average 2022-05-01 to 2022-05-15



# Tempestade Subtropical Yakecan

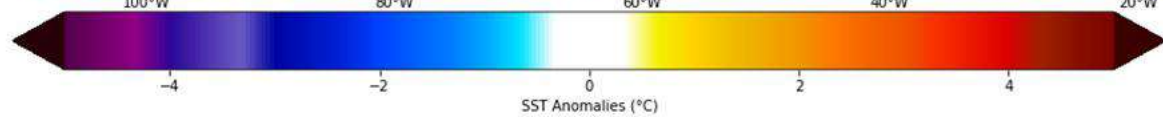
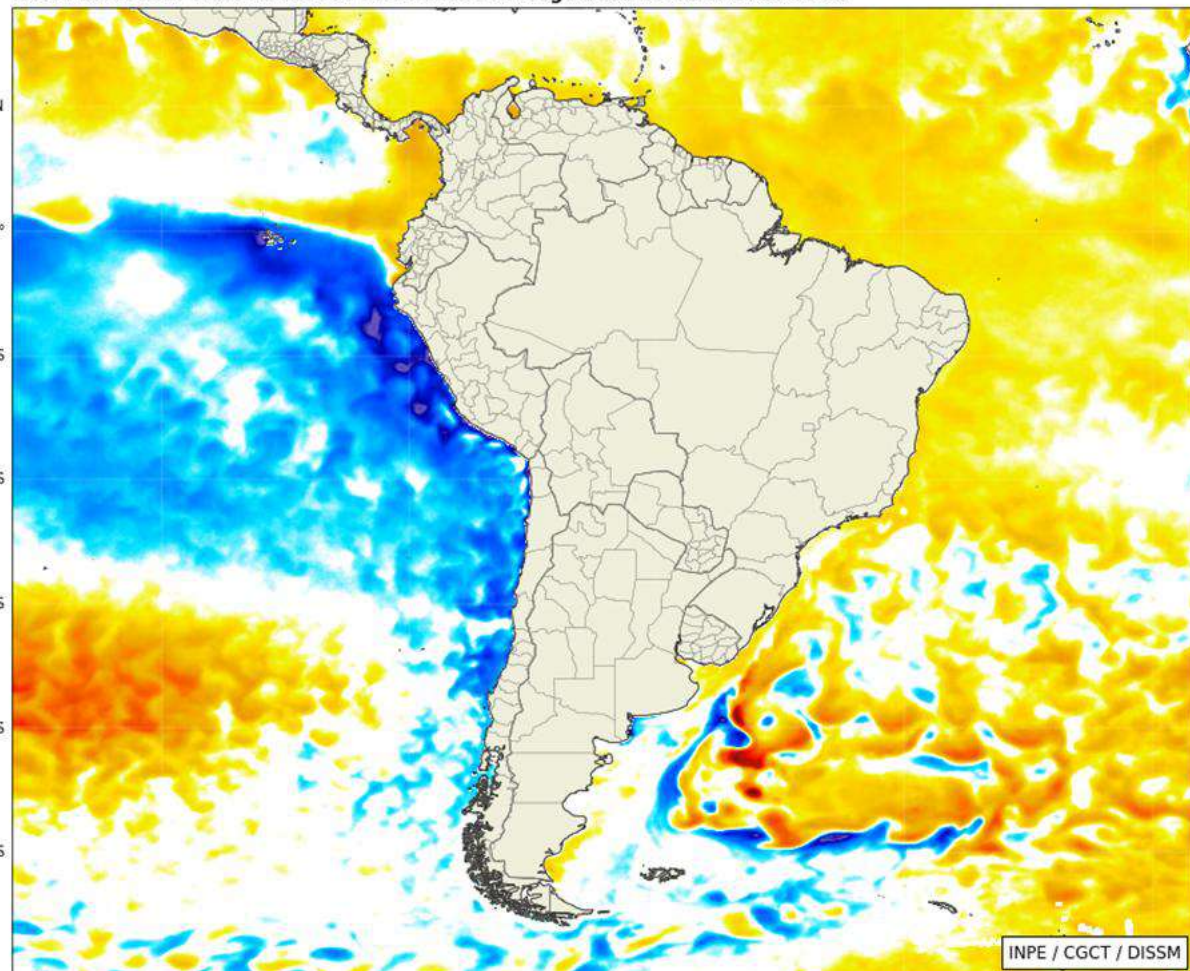
GOES-Leste ABI IR-10.35 $\mu$ m ch.13

GOES-Leste ABI IR\_10.35 2022-05-15 18:00 UTC Reg.: [-112.0, -60.0, -16.5, 18.0]



NOAA SST-A : 01-15/05/2022

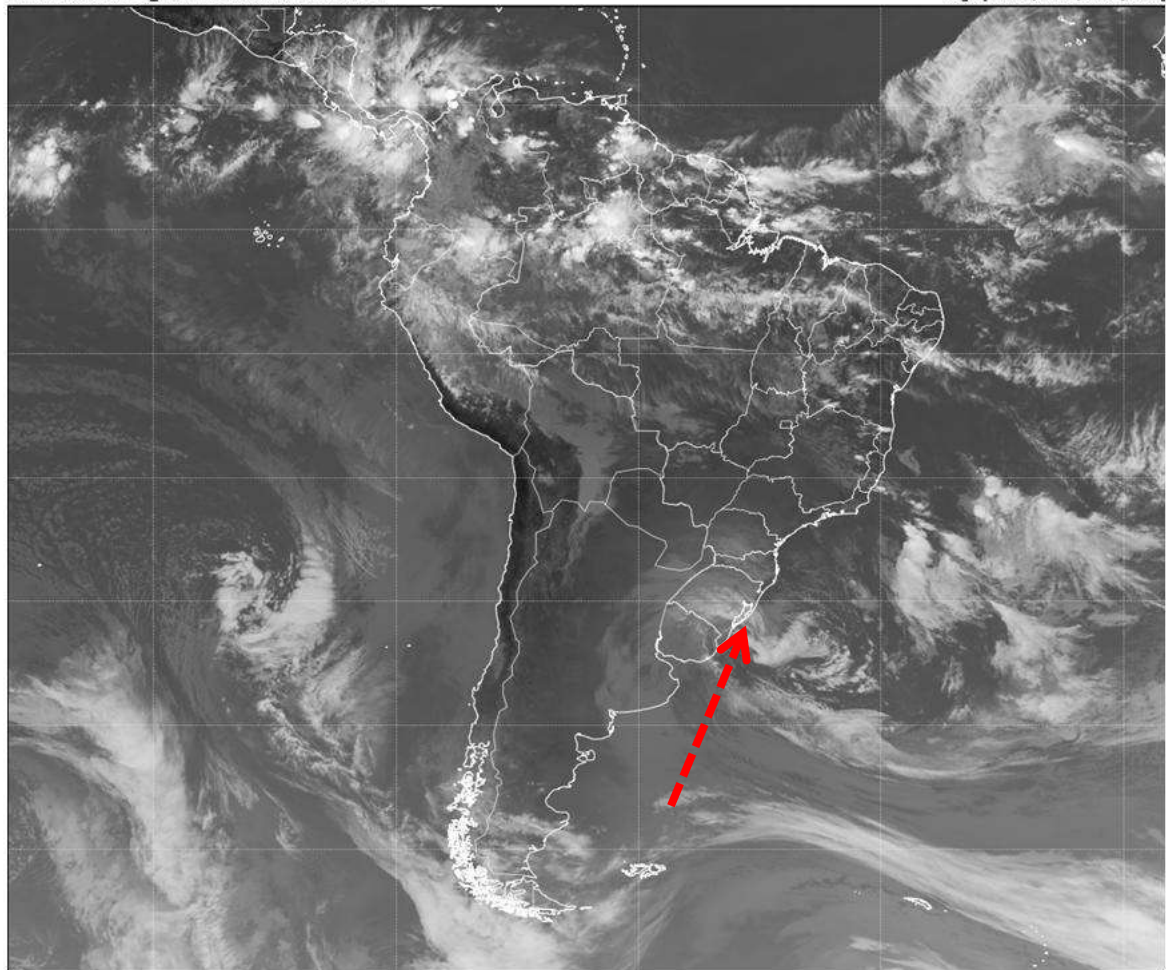
NOAA Coral Reef Watch 5 km SST Anomalies - Average 2022-05-01 to 2022-05-15



# Tempestade Subtropical Yakecan

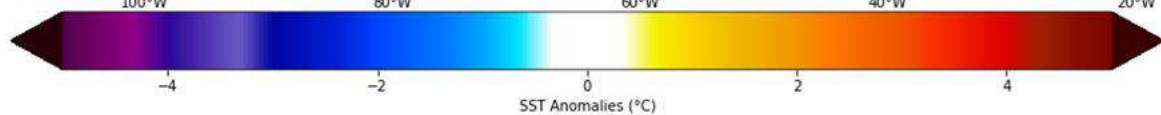
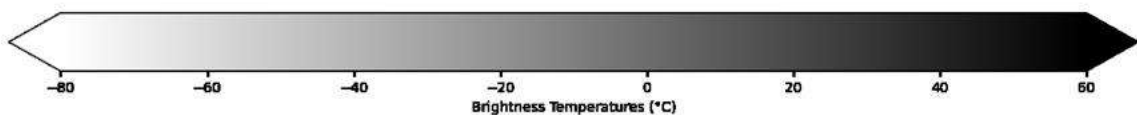
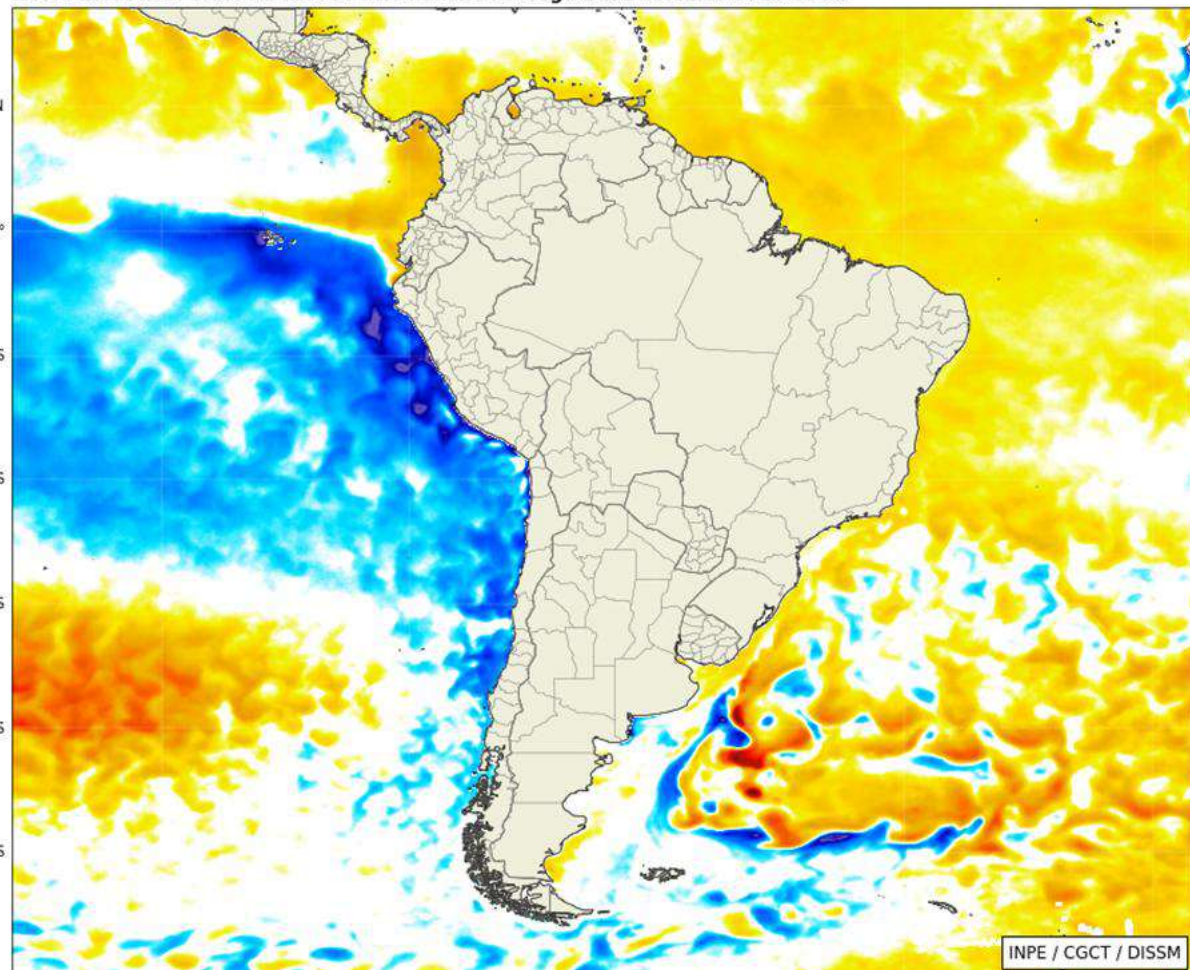
GOES-Leste ABI IR-10.35 $\mu\text{m}$  ch.13

GOES-Leste ABI IR\_10.35 2022-05-17 18:00 UTC Reg.: [-112.0, -60.0, -16.5, 18.0]



NOAA SST-A : 01-15/05/2022

NOAA Coral Reef Watch 5 km SST Anomalies - Average 2022-05-01 to 2022-05-15



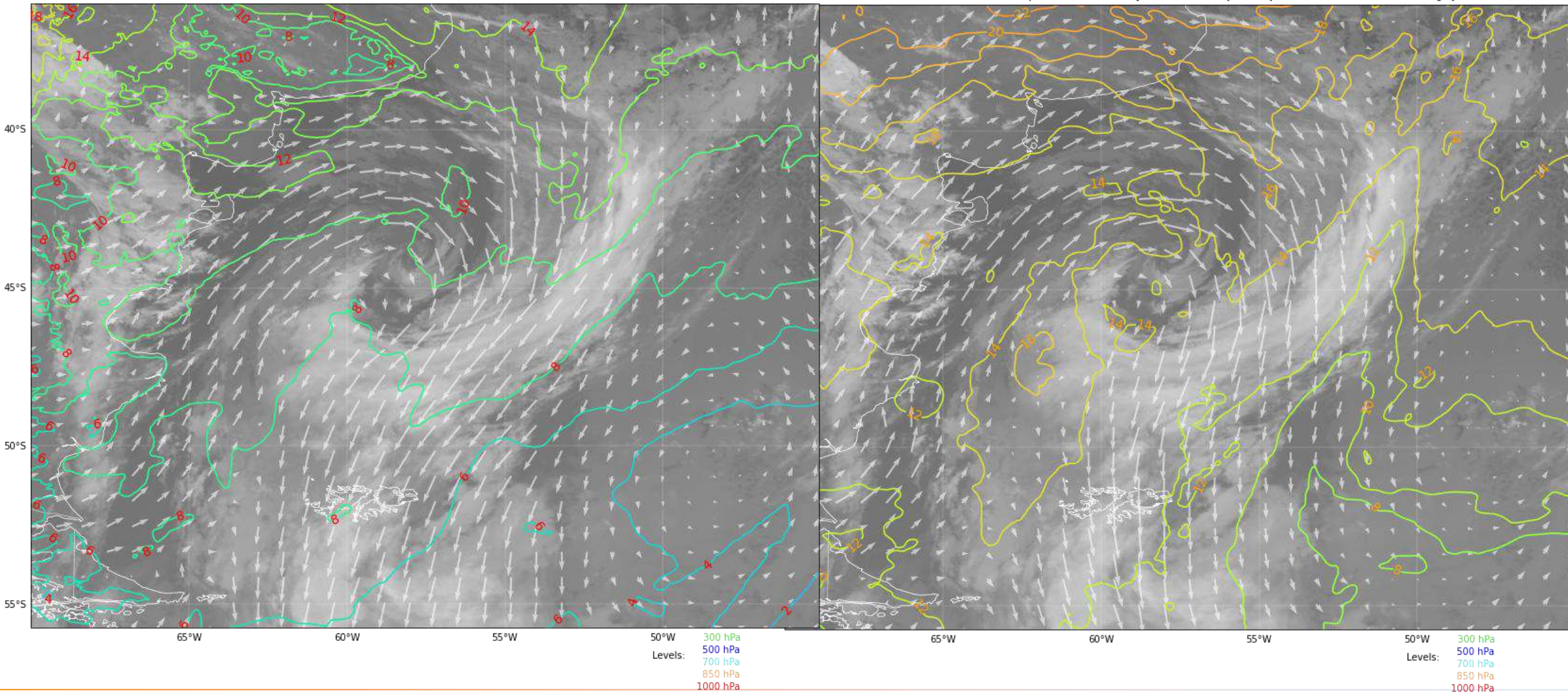
# Ciclone na fase extratropical

## GOES-Leste ABI IR-10.35µm ch.13 & WRF Temp.Pot.camadas : 2022/05/14 00:00UTC

GOES-Leste ABI IR10.35 2022-05-14 00:00UTC, WRF Potential Temperature + wind (1000hPa)

GOES-Leste ABI IR10.35 2022-05-14 00:00UTC, WRF Potential Temperature + wind (850hPa)

Reg.: [-70.0, -57.0, -45.0, -36.0]



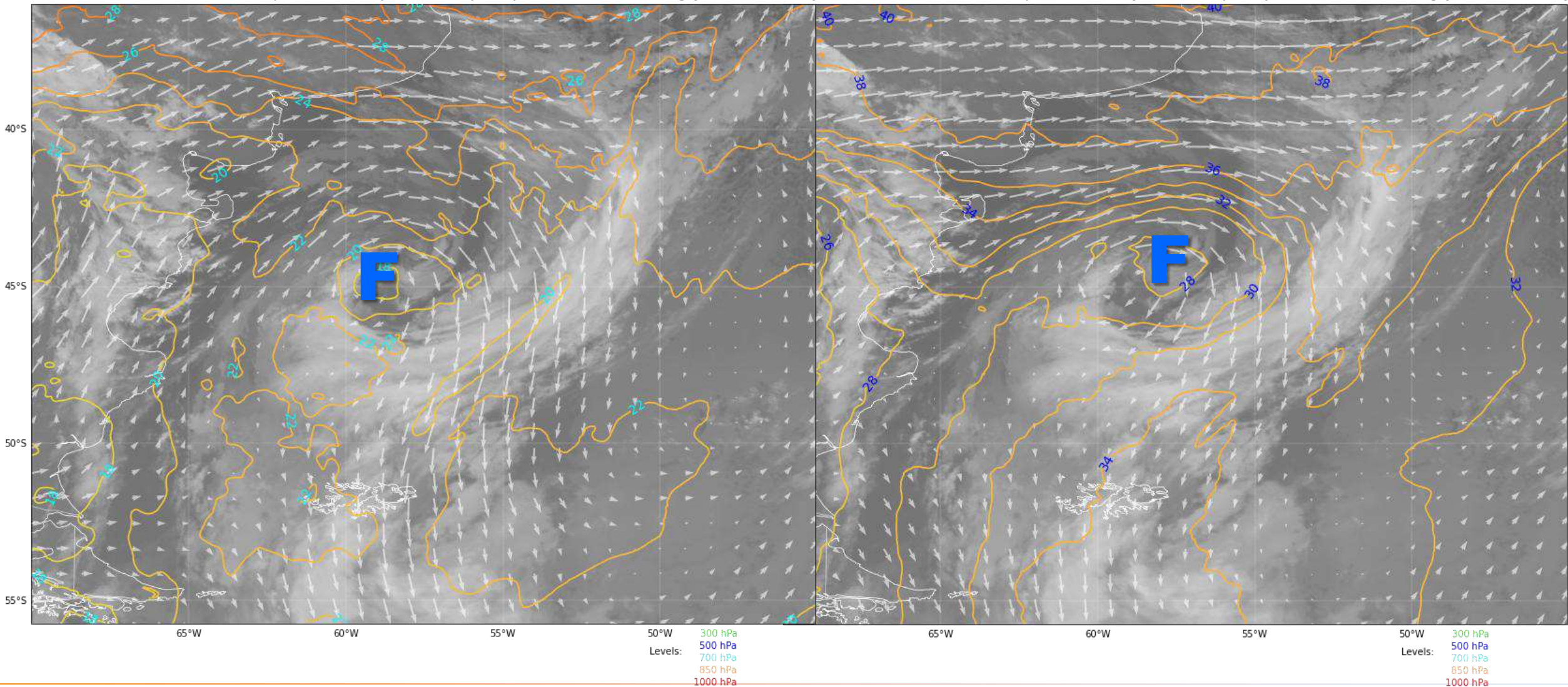
# Ciclone na fase extratropical

## GOES-Leste ABI IR-10.35µm ch.13 & WRF Temp.Pot.camadas : 2022/05/14 00:00UTC

GOES-Leste ABI IR10.35 2022-05-14 00:00UTC, WRF Potential Temperature + wind (700hPa)

GOES-Leste ABI IR10.35 2022-05-14 00:00UTC, WRF Potential Temperature + wind (500hPa)

Reg.: [-70.0, -57.0, -45.0, -36.0]



# Oceano Atlântico

NOAA SST-A : Média mensal de 2022

Anomalia mostra o desvio em relação ao que é normal para a época do ano

Cores quentes = temperaturas acima do normal

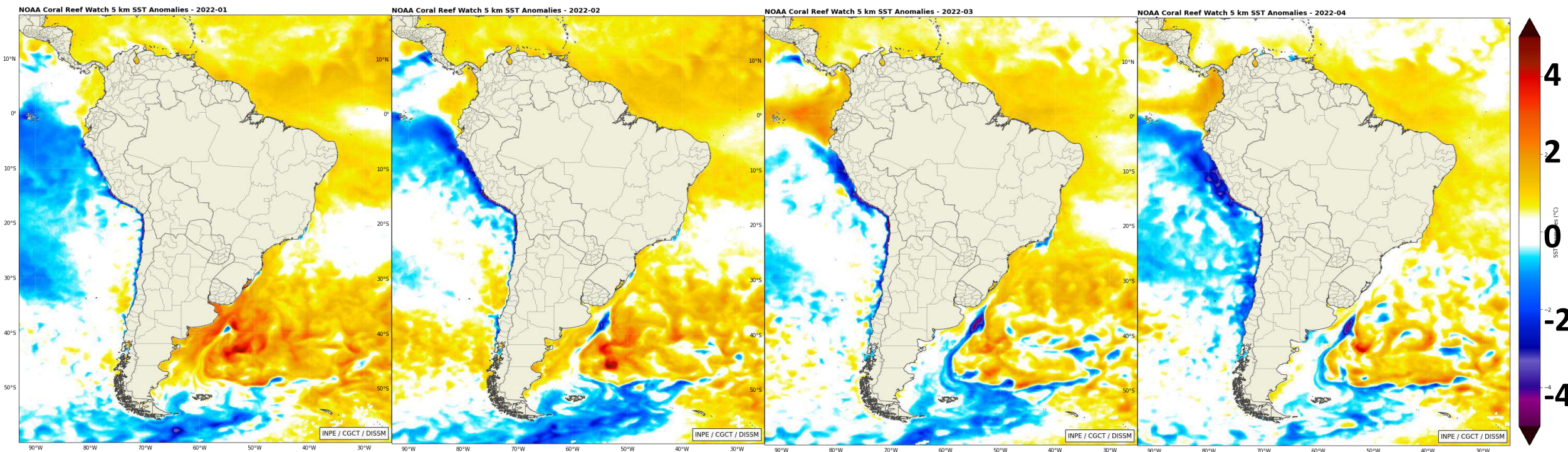
Cores frias = temperaturas abaixo do normal

Jan 2022

Fev 2022

Mar 2022

Abr 2022

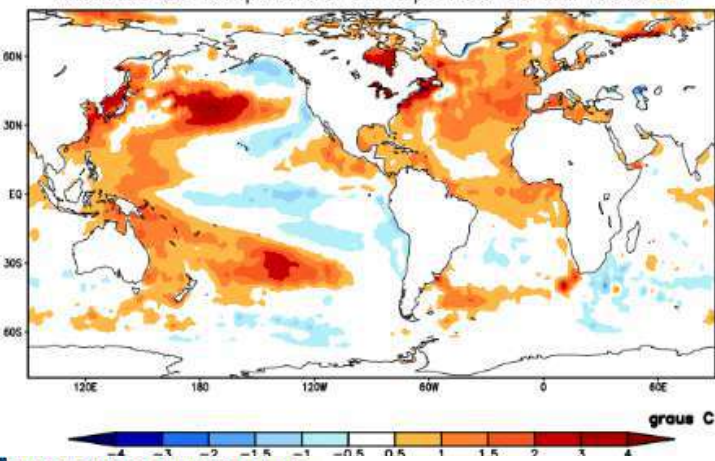




# PREVISÃO CLIMÁTICA SAZONAL – INPE e parceiros

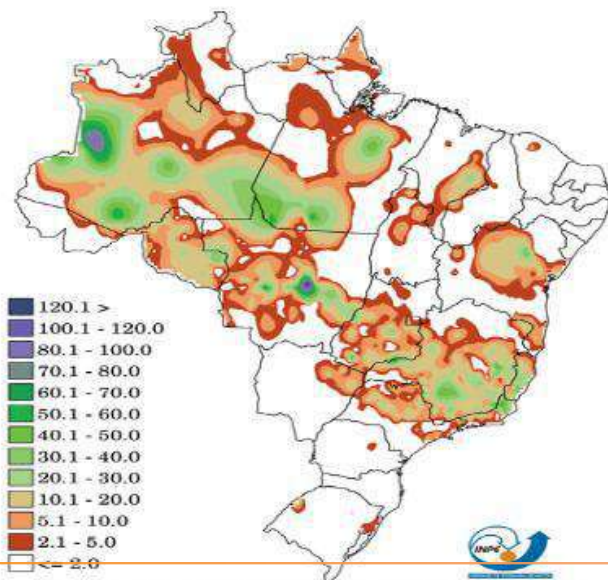
## MONITORAMENTO GLOBAL

Anomalia de Temperatura da Superfície do Mar OCT2021



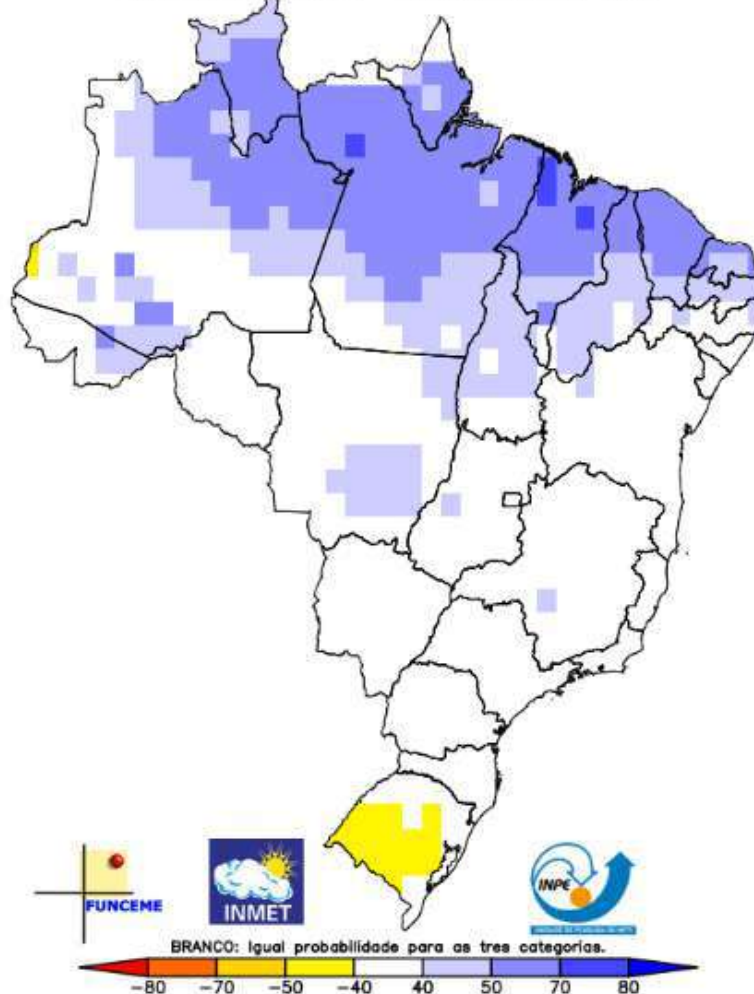
## MONITORAMENTO

Precipitação Observada (mm) - 01/12/2021



## PREVISÃO CLIMÁTICA

Multi-modelo CPTEC/INMET/FUNCEME  
 Probab. tercil mais provável: Precip. (%)  
 Produzida: Nov 2021 Valida para DJF 2021



## PREVISÃO CLIMÁTICA SAZONAL

### Resumo das Condições Climáticas Atuais

A Figura 1 mostra as anomalias de temperatura da superfície do mar (TSM), precipitação e temperatura máxima para o mês de outubro. Na região do Oceano Pacífico equatorial foram observadas anomalias negativas, com um padrão característico de condições de La Niña. Sobre o Atlântico Tropical persistiram anomalias positivas de TSM, que influenciam a circulação leste-oeste neste setor e modula o comportamento da precipitação em parte da faixa norte do Brasil. Desta forma, no mês de outubro foram registradas chuvas acima da média climatológica em parte das Regiões Norte e Nordeste. Em parte da faixa central do Brasil, assim como no mês anterior, houve uma mudança no padrão de chuvas, com a organização da convecção e o alinhamento de um canal de umidade, comum nesta estação, o qual gerou precipitação acima da média. Em parte do centro-sul do país (MS, PR, oeste de SC e do RS e sul de SP), as chuvas acima da média estiveram associadas aos sistemas frontais e cavados na troposfera média. Já nos extremos oeste e sul do país, a precipitação se manteve abaixo da média. As temperaturas máximas no mês de outubro, em geral, acompanharam o comportamento da precipitação, com valores dentro ou abaixo da média histórica em parte da faixa norte, centro e leste do país e acima da média nos extremos sul, oeste, norte e boa parte do centro e leste do Nordeste.



Figura 1. Anomalias de temperatura da superfície do mar, precipitação e temperatura máxima para outubro de 2021, da esquerda para a direita, respectivamente.

### Previsão Climática para DJF 2021/2022

A Figura 2 mostra a previsão probabilística de precipitação em três categorias produzida com o método objetivo (cooperação entre CPTEC/INPE, INMET e FUNCEME), para o trimestre dezembro-janeiro-fevereiro (DJF) de 2021/2022. A previsão indica maior probabilidade de chuva na categoria acima da faixa normal em grande parte do norte e uma parte do centro do Brasil. Para grande parte do RS há maior probabilidade para ocorrência de chuvas na categoria abaixo da faixa normal. As áreas em branco correspondem igual probabilidade para as três categorias. É importante destacar que não se descarta a ocorrência de eventos de chuva expressiva no setor sul do Brasil. No entanto, a alta probabilidade de continuidade de condições de La Niña (92%), poderá gerar condições de déficit de precipitação em DJF em grande parte do Sul do país. Nas áreas em branco, principalmente entre o centro e leste do país, embora haja maior incerteza, não se descartam eventos de chuva expressiva, típica para a época do ano. Neste trimestre é comum dias secos (veranicos) intercalados com dias mais chuvosos. Em relação à temperatura do ar, há maior probabilidade para a categoria acima da faixa normal em grande parte do centro e norte do Brasil.



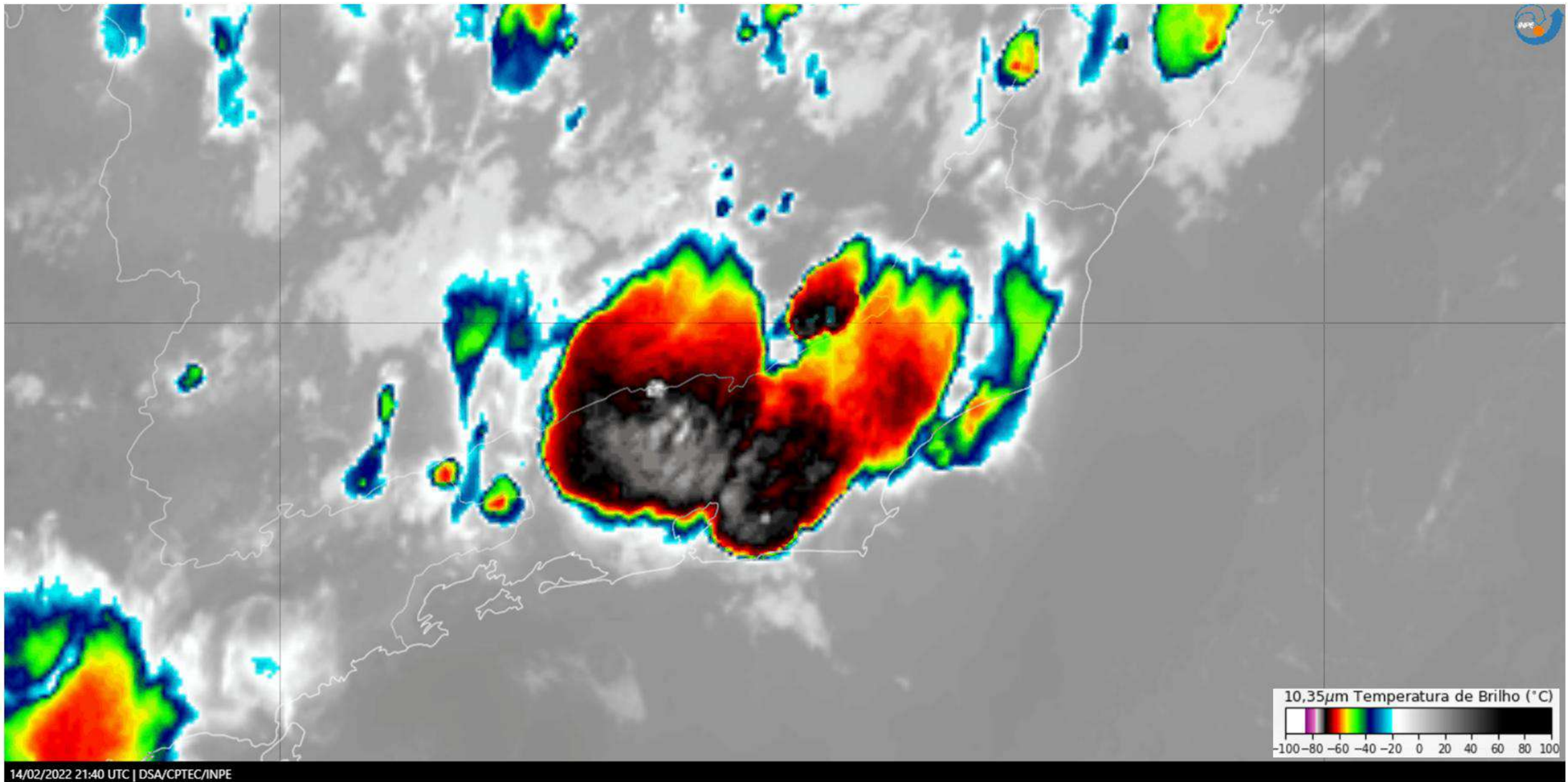
Nota: O método objetivo é baseado em uma metodologia de regressão da média estatística das previsões dos modelos que compõem o conjunto Multi-Modelo.  
 \*Normal  
 CPTEC/INMET/FUNCEME que incorpora informação da dinâmica retrospectiva (1981-2010) das previsões desse conjunto.

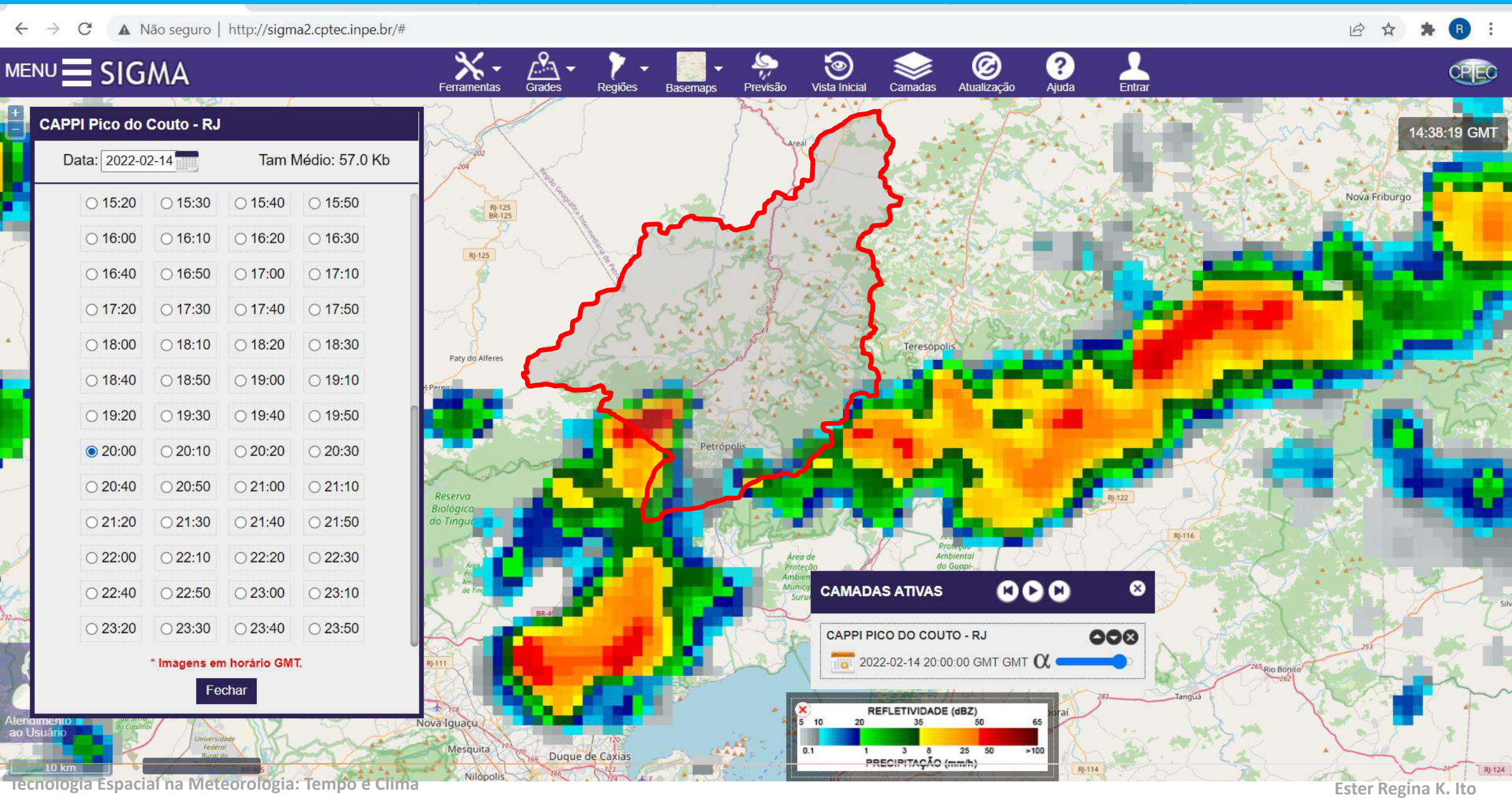
Figura 2: Previsão Climática sazonal por tercil (categorias abaixo da faixa normal, dentro da faixa normal e acima da faixa normal), gerada pelo método objetivo (CPTEC/INPE, INMET e FUNCEME). As áreas em branco indicam igual probabilidade para as tres categorias.

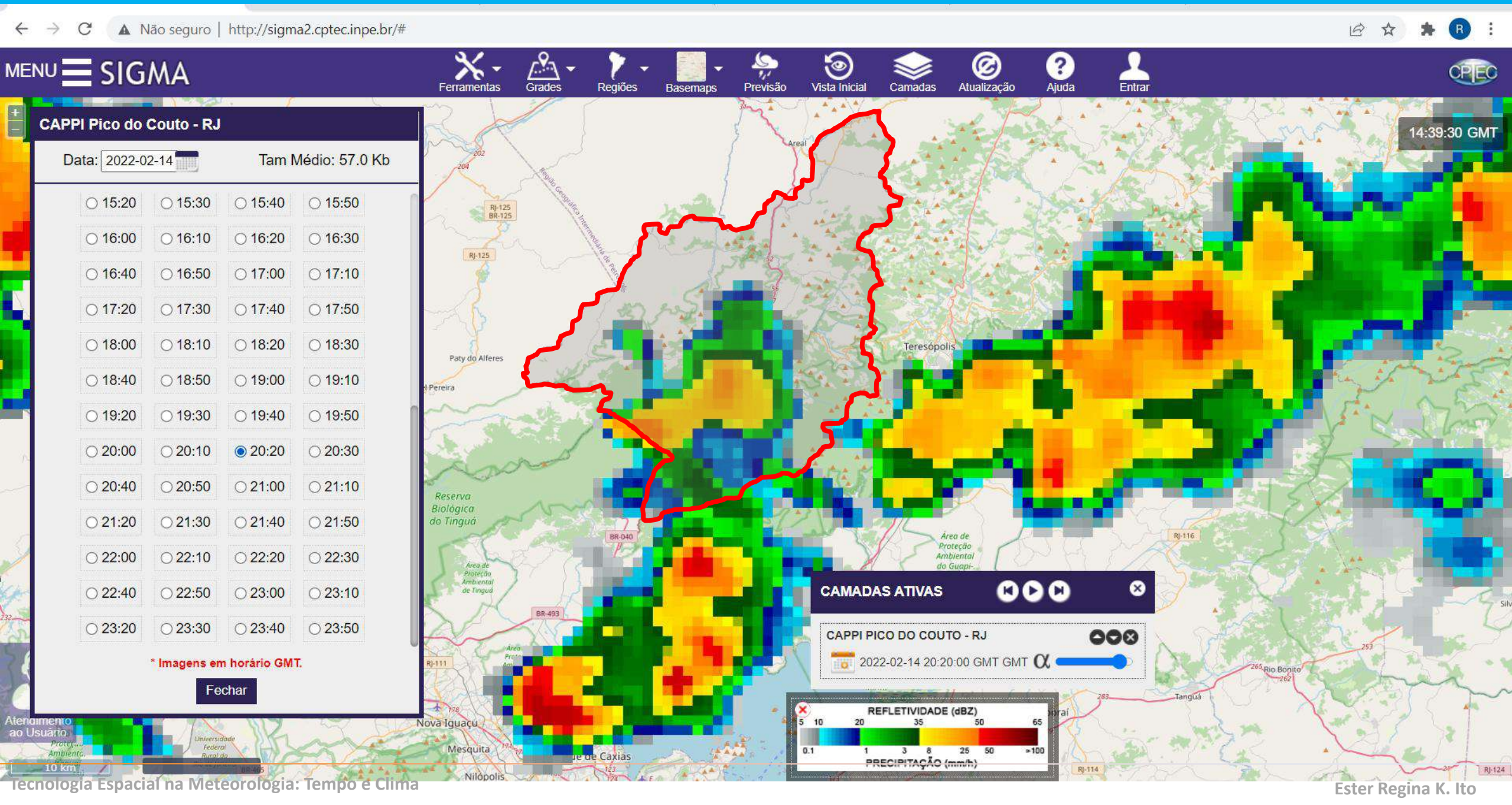
Temos tempo para ver mais uma ocorrência meteorológica interessante?

# Map with the delimitation of the Petrópolis City, in Rio de Janeiro State









## CAPPI Pico do Couto - RJ

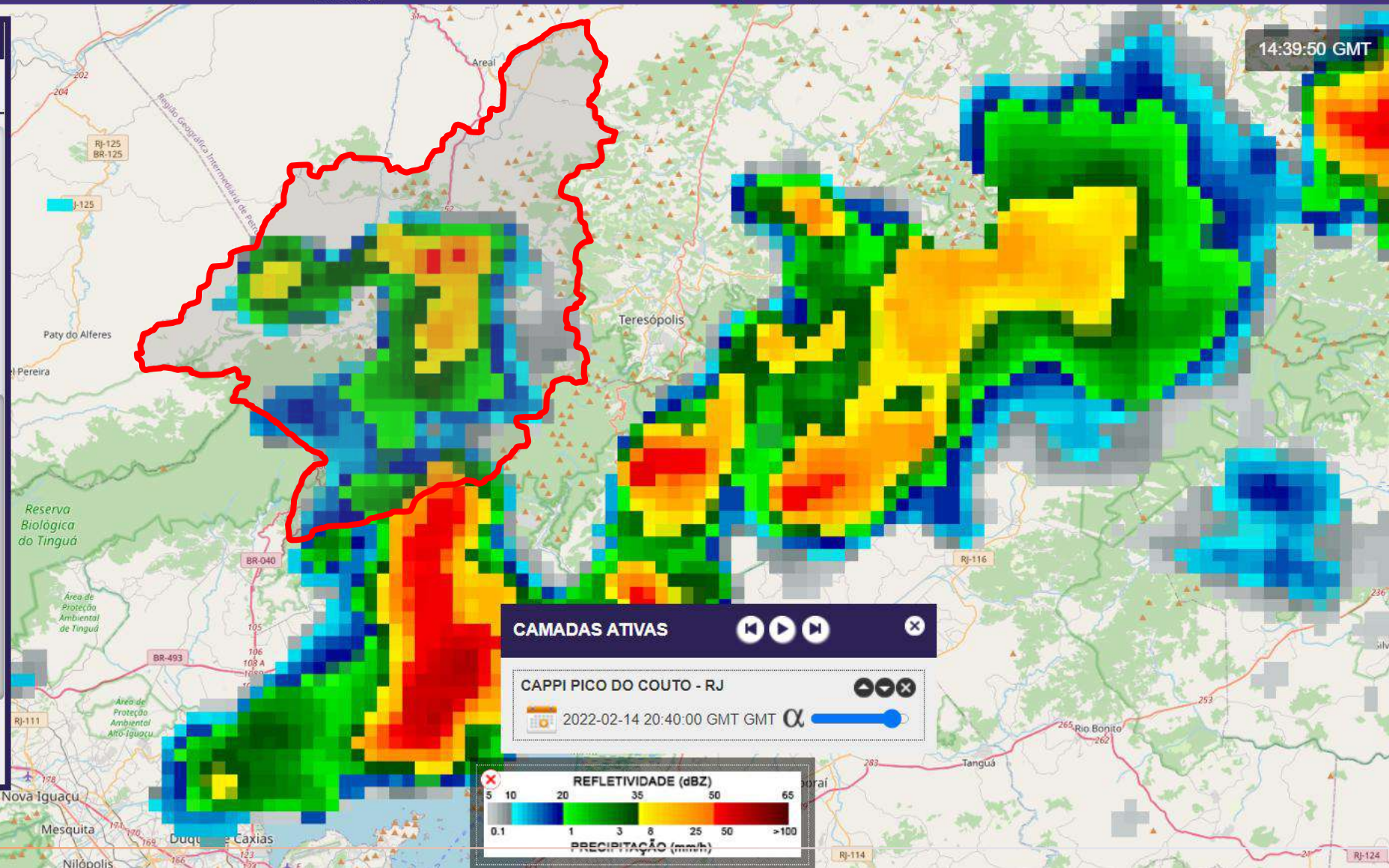
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Tam Médio: 57.0 Kb

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\* Imagens em horário GMT.

Fechar



## CAPPI Pico do Couto - RJ

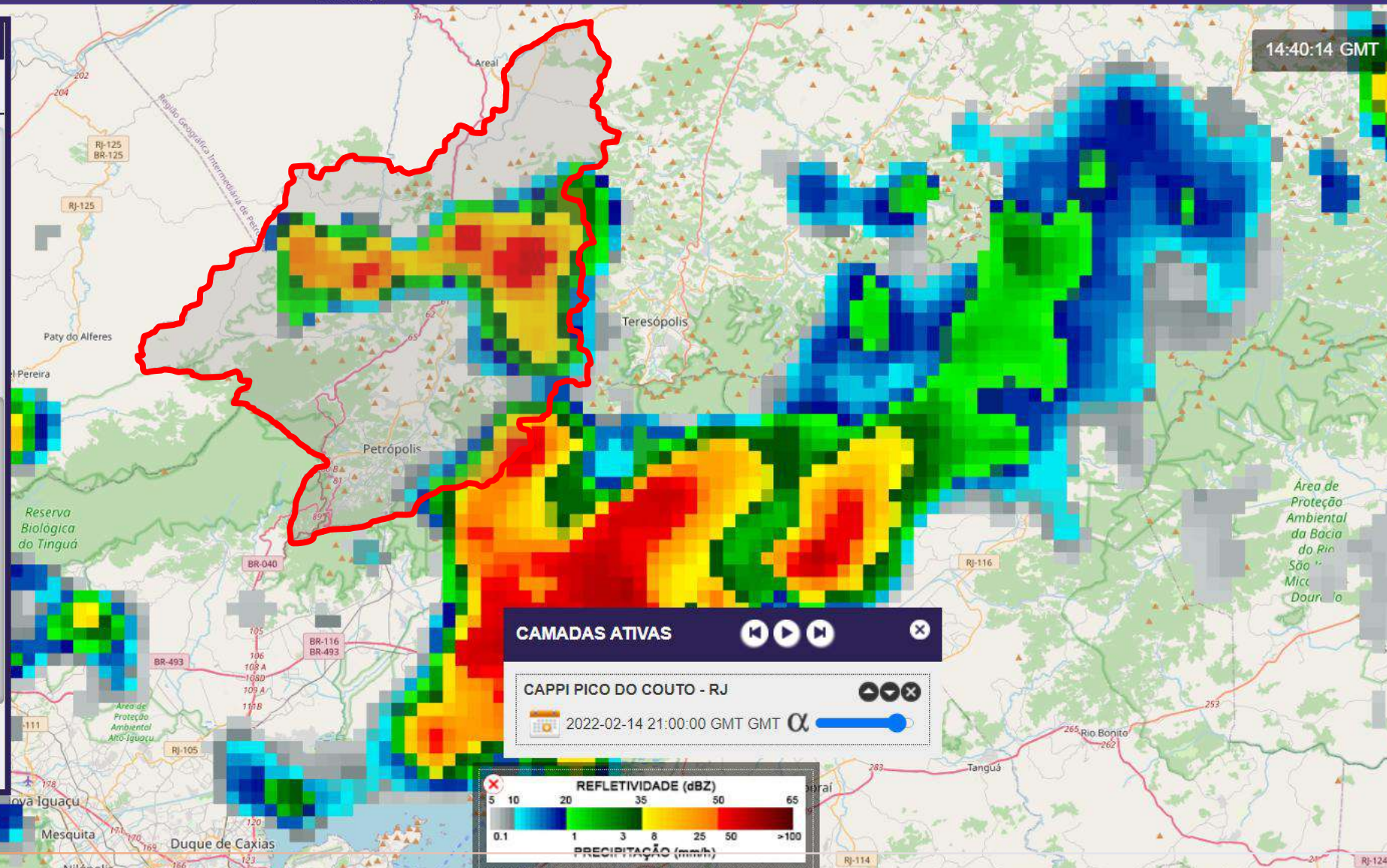
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Tam Médio: 57.0 Kb

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\* Imagens em horário GMT.

Fechar



14:40:14 GMT

### CAMADAS ATIVAS

CAPPI PICO DO COUTO - RJ

2022-02-14 21:00:00 GMT GMT



## CAPPI Pico do Couto - RJ

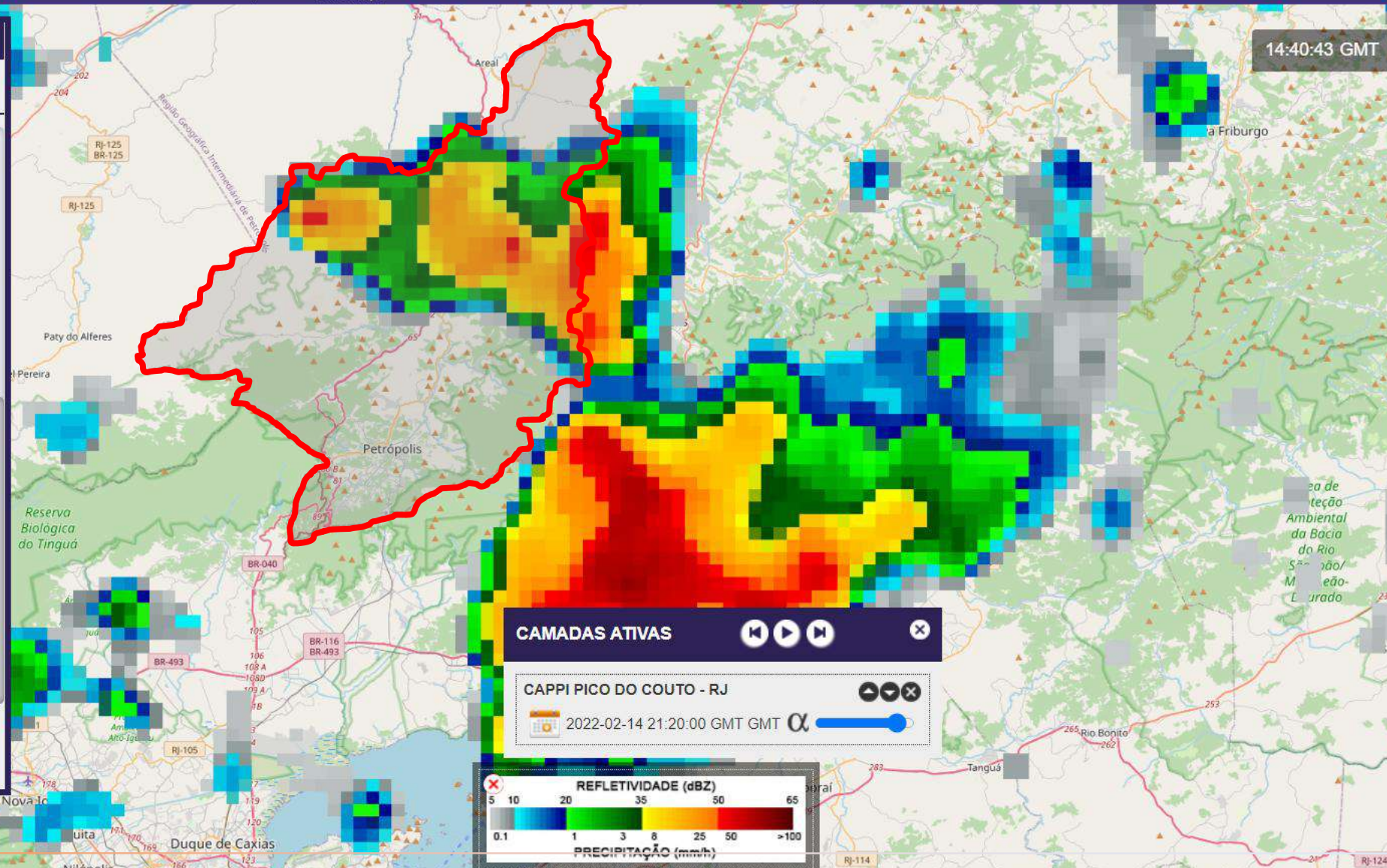
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Tam Médio: 57.0 Kb

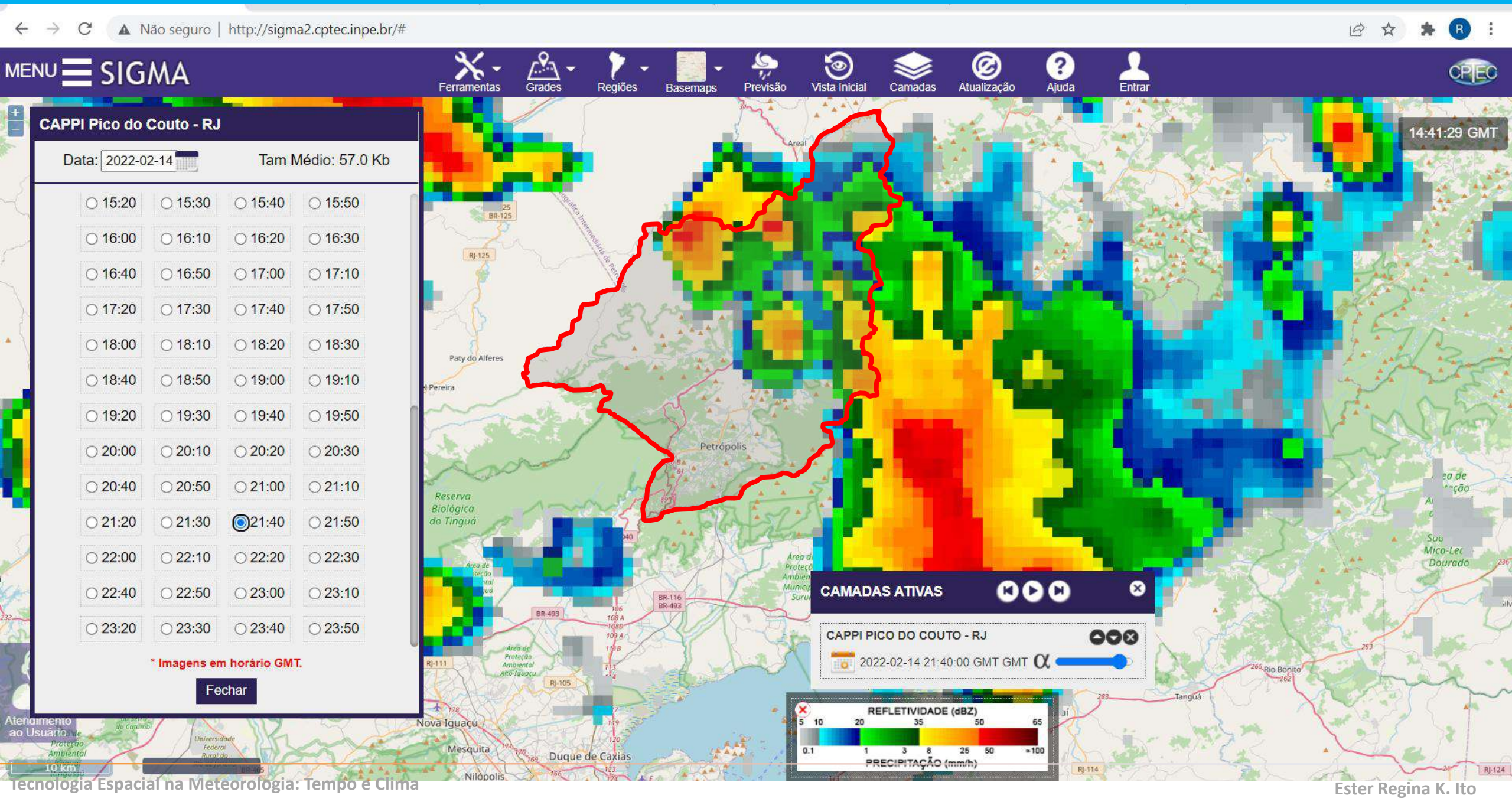
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\* Imagens em horário GMT.

Fechar



# Feb 14th 2022 – Weather Radar Pico do Couto/RJ



## CAPPI Pico do Couto - RJ

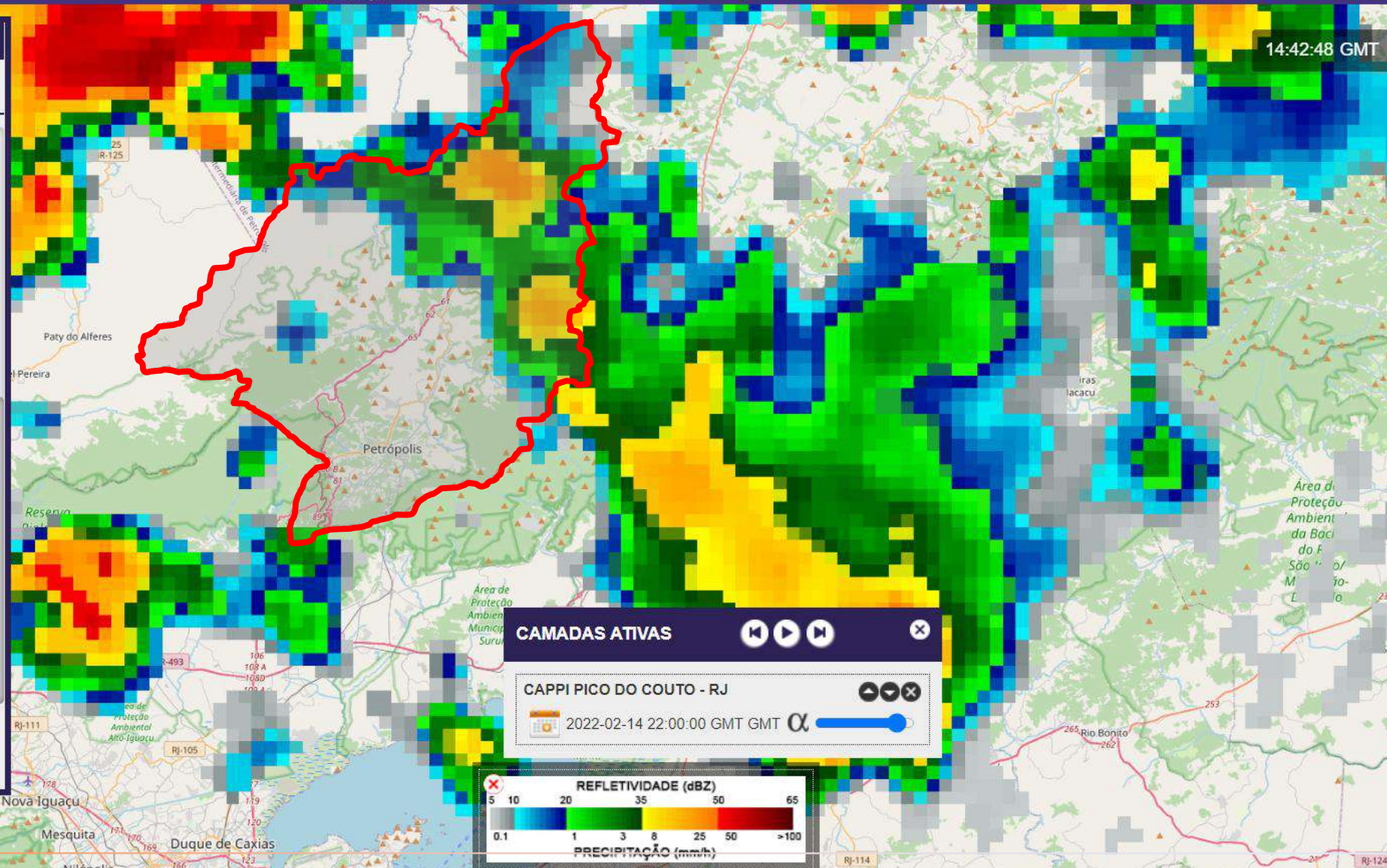
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Tam Médio: 57.0 Kb

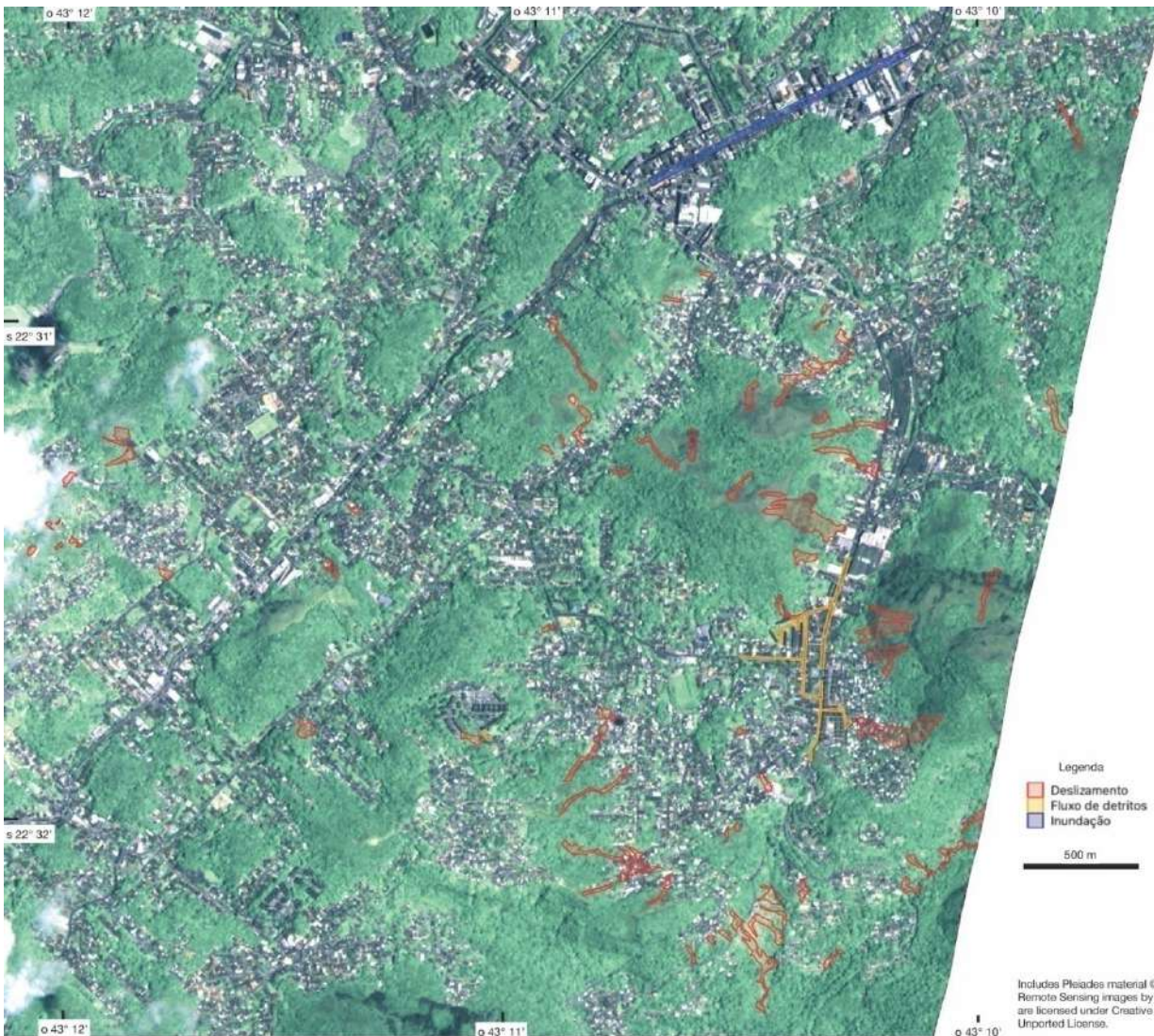
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- 19:20  19:30  19:40  19:50
- 20:00  20:10  20:20  20:30
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- 21:20  21:30  21:40  21:50
- 22:00  22:10  22:20  22:30
- 22:40  22:50  23:00  23:10
- 23:20  23:30  23:40  23:50

\* Imagens em horário GMT.

Fechar



# Tragedy Day : Feb 15th 2022



## Petrópolis - RJ Áreas Afetadas

Ocorrências extraídas da imagem Pleiades do dia 17/Fev/2022

Imagem de fundo CBERS-4A, sensor WPM, de 27/Dez/2021

Ativação da Carta Internacional - Chamado 864



CENAD



Legenda  
■ Deslizamento  
■ Fluxo de detritos  
■ Inundação

500 m

Inclui Pleiades material © CNES (2022), Distribution Airbus DS  
 Remote Sensing images by INPE - National Institute for Space Research  
 are licensed under Creative Commons Attribution-Share Alike 3.0  
 Unported License.



Landslide Scars -  
 Alto da Serra -  
 Petrópolis/RJ

■ Landslide  
■ Debris flow



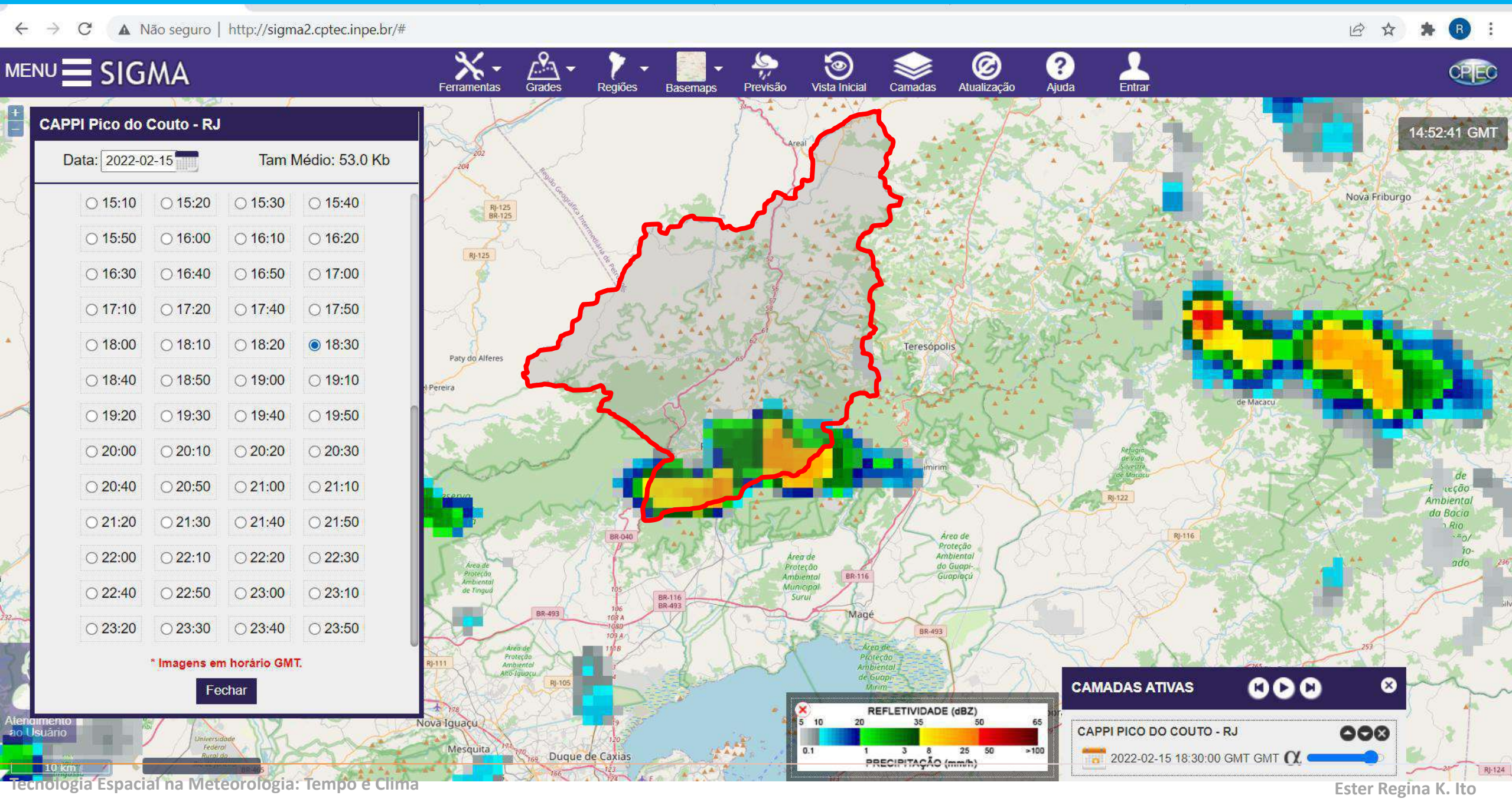
0 100 200 m

Scale: 1:5.000  
 Geographic Coordinate System  
 UTM Zone 18N

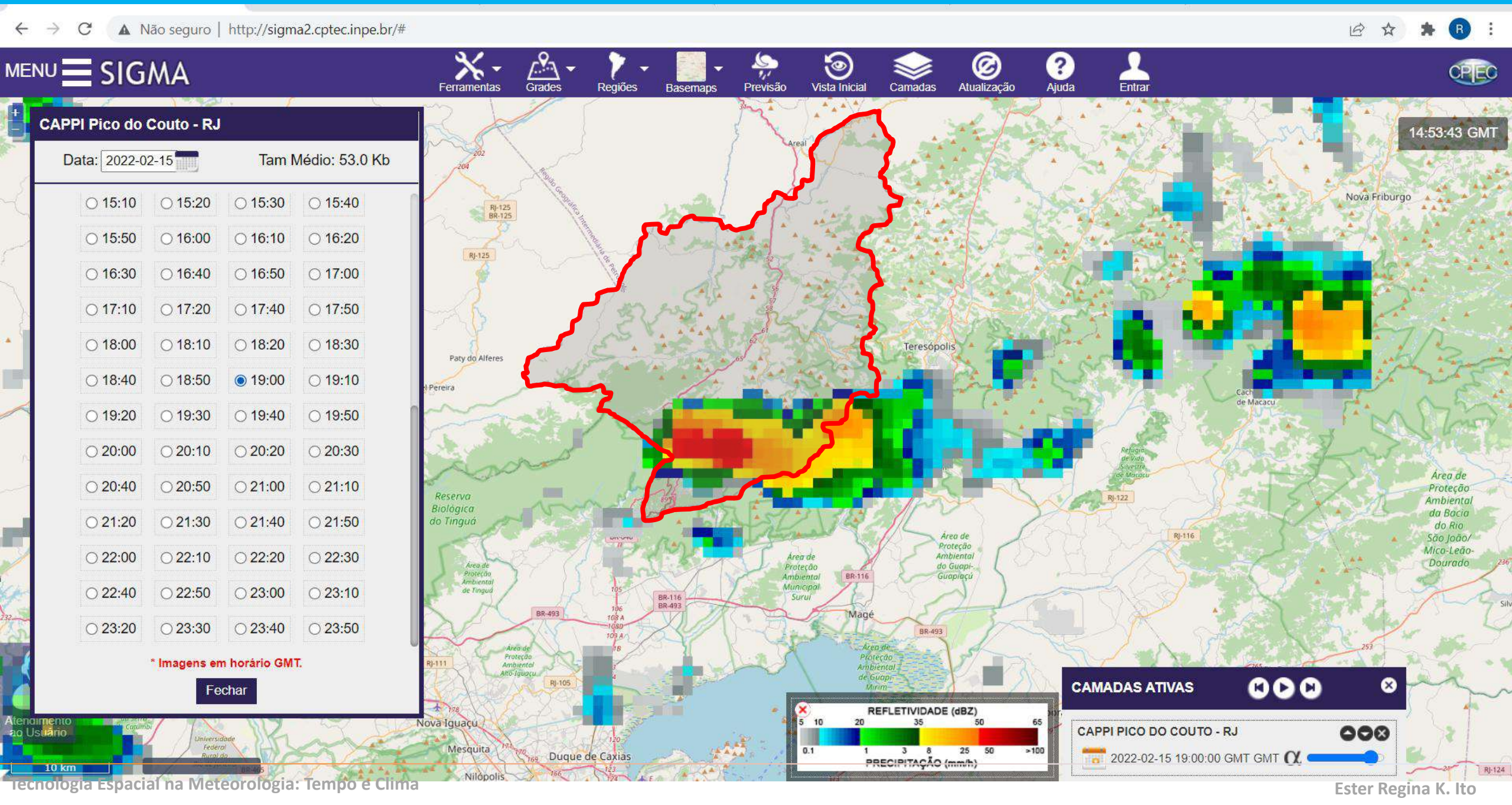
Estu. Regina K. Ito

<https://disasterscharter.org/>

# Feb 15th 2022 – Weather Radar Pico do Couto/RJ



# Feb 15th 2022 – Weather Radar Pico do Couto/RJ



# Feb 15th 2022 – Weather Radar Pico do Couto/RJ

## CAPPI Pico do Couto - RJ

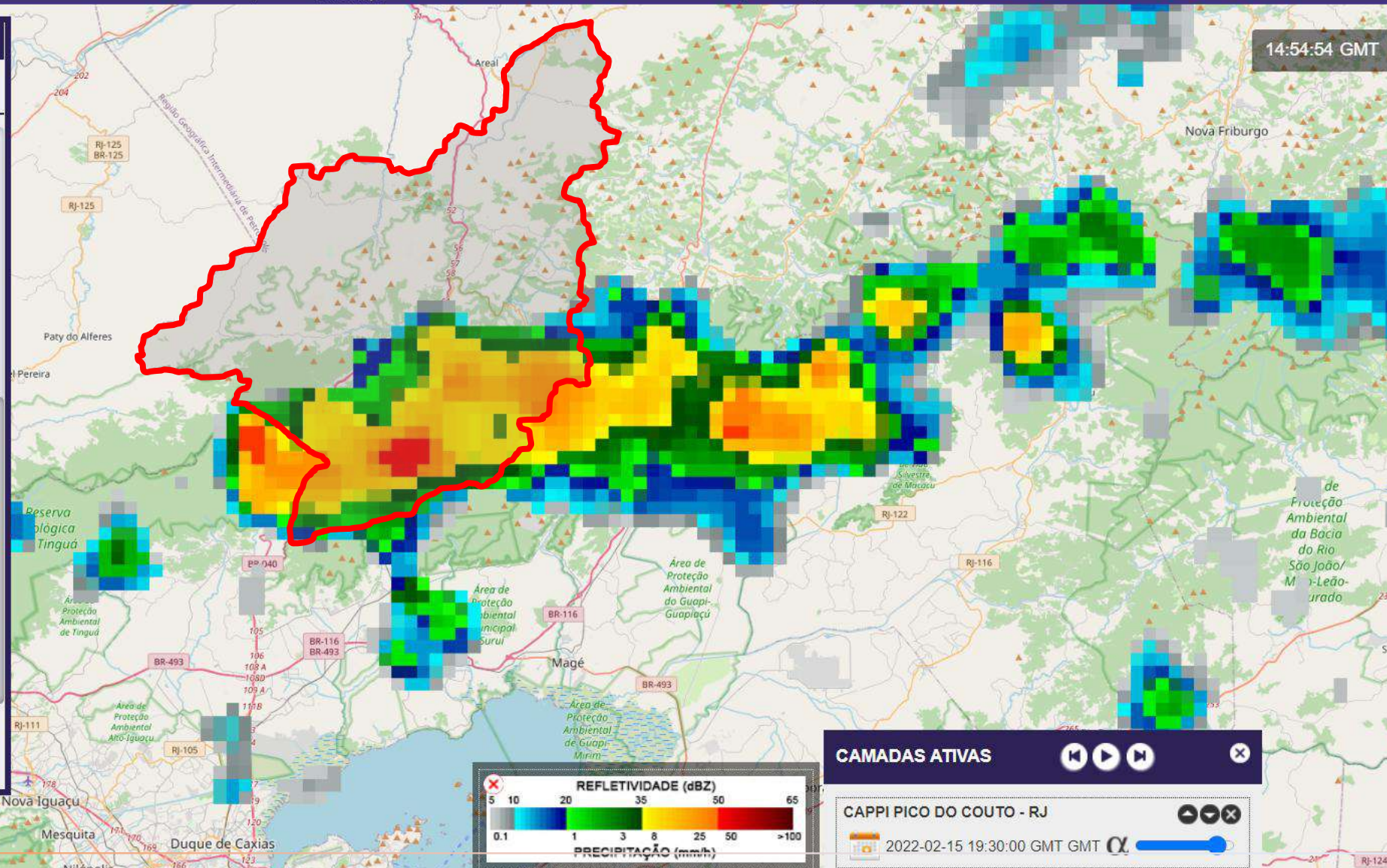
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Tam Médio: 53.0 Kb

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\* Imagens em horário GMT.

Fechar



14:54:54 GMT

CAMADAS ATIVAS

CAPPI PICO DO COUTO - RJ  
2022-02-15 19:30:00 GMT GMT

## CAPPI Pico do Couto - RJ

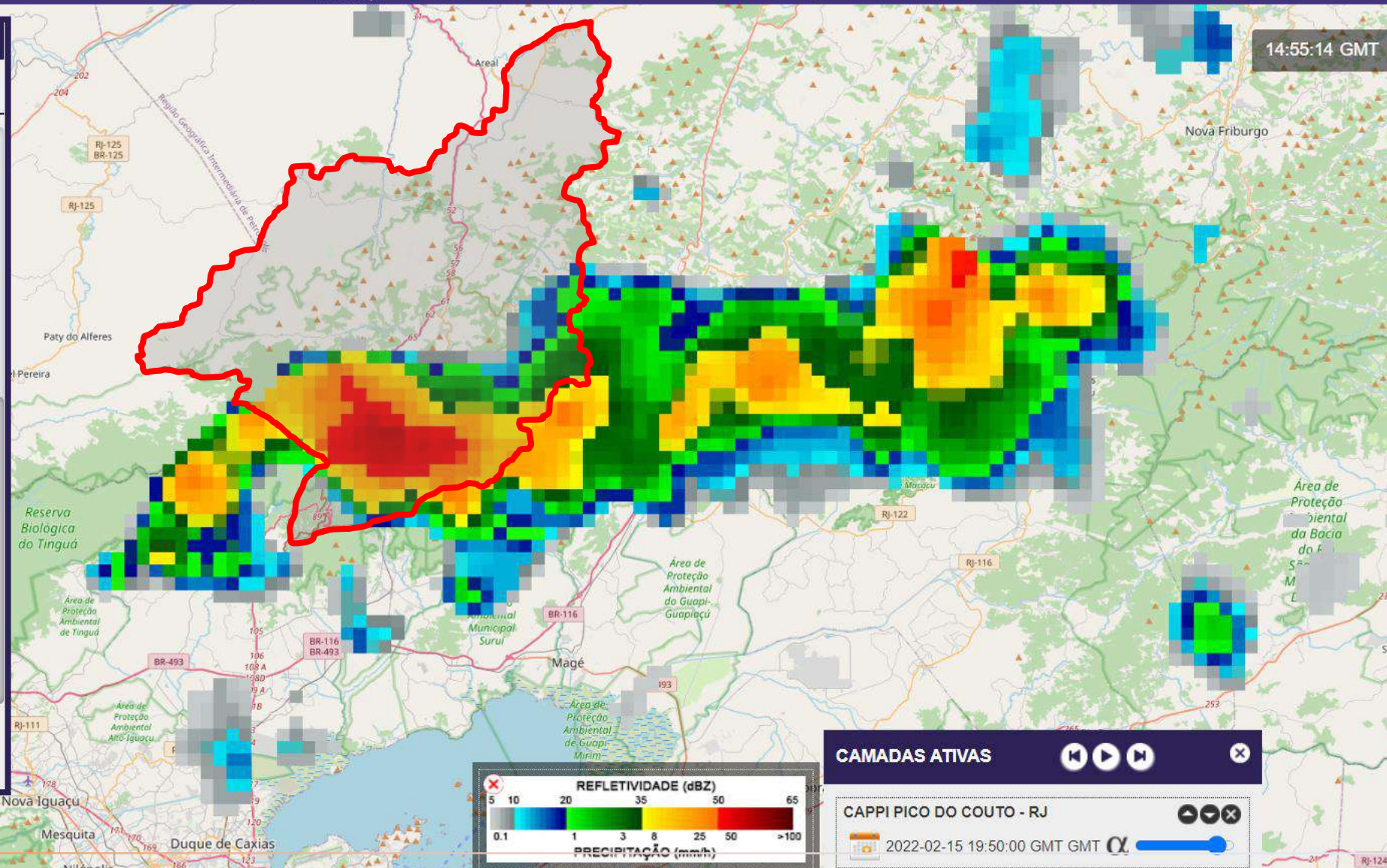
Data: 2022-02-15

Tam Médio: 53.0 Kb

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- 18:00  18:10  18:20  18:30
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- 20:00  20:10  20:20  20:30
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- 21:20  21:30  21:40  21:50
- 22:00  22:10  22:20  22:30
- 22:40  22:50  23:00  23:10
- 23:20  23:30  23:40  23:50

\* Imagens em horário GMT.

Fechar



14:55:14 GMT

CAMADAS ATIVAS

CAPPI PICO DO COUTO - RJ  
2022-02-15 19:50:00 GMT GMT



# Feb 15th 2022 – Weather Radar Pico do Couto/RJ

## CAPPI Pico do Couto - RJ

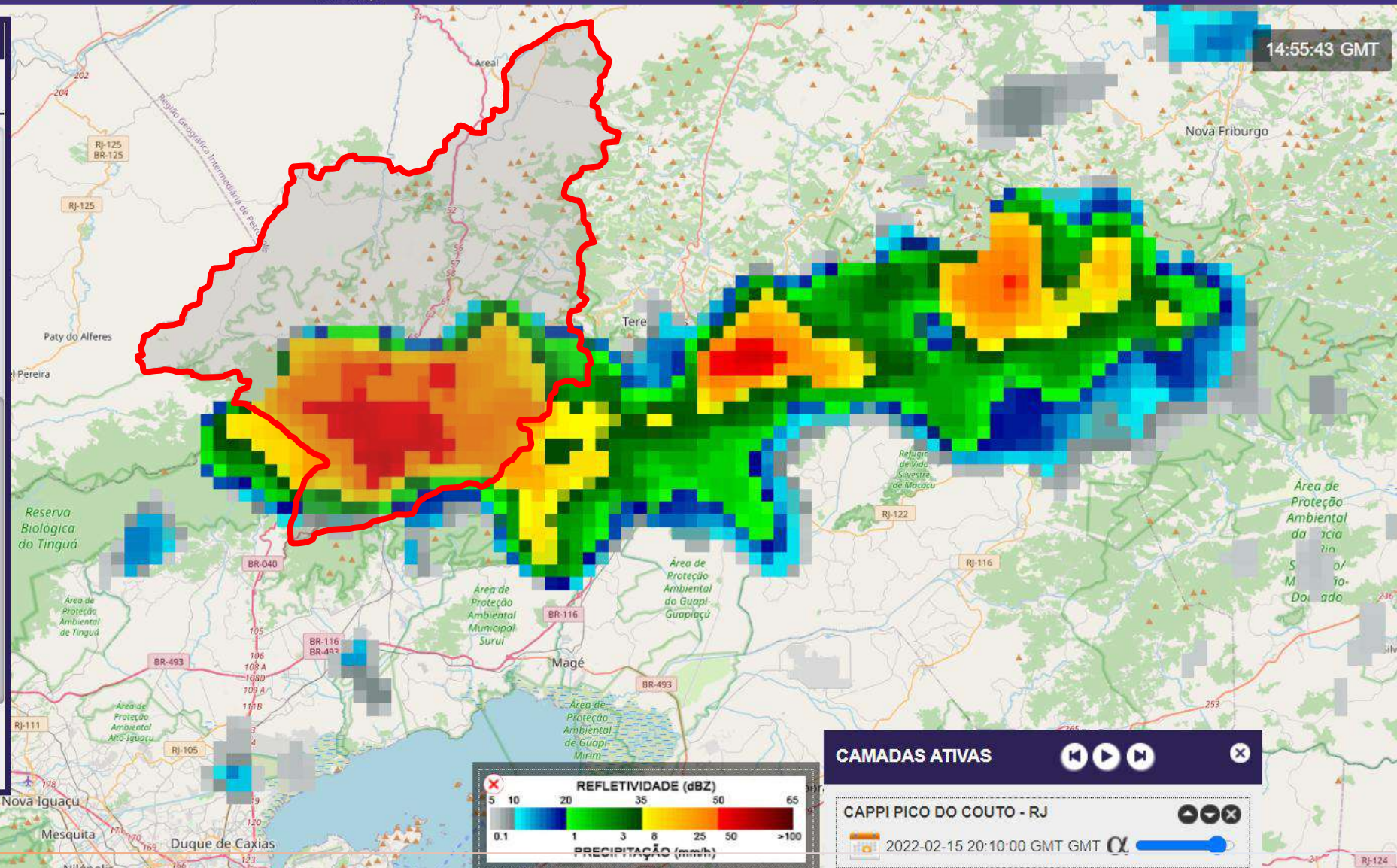
Data: 2022-02-15

Tam Médio: 53.0 Kb

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- 22:00  22:10  22:20  22:30
- 22:40  22:50  23:00  23:10
- 23:20  23:30  23:40  23:50

\* Imagens em horário GMT.

Fechar



14:55:43 GMT

CAMADAS ATIVAS

CAPPI PICO DO COUTO - RJ  
2022-02-15 20:10:00 GMT GMT

# Feb 15th 2022 – Weather Radar Pico do Couto/RJ

## CAPPI Pico do Couto - RJ

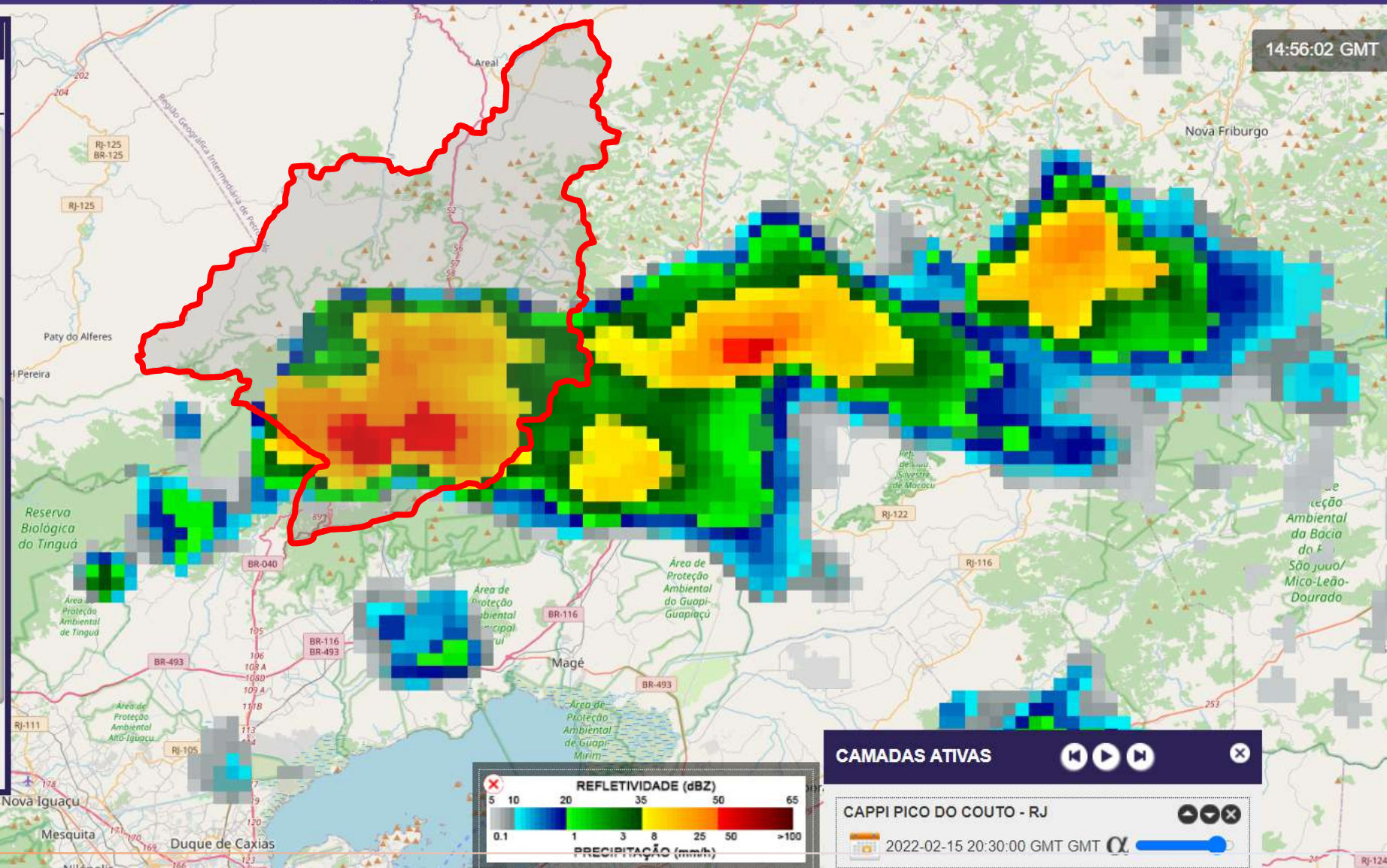
Data: 2022-02-15

Tam Médio: 53.0 Kb

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\* Imagens em horário GMT.

Fechar

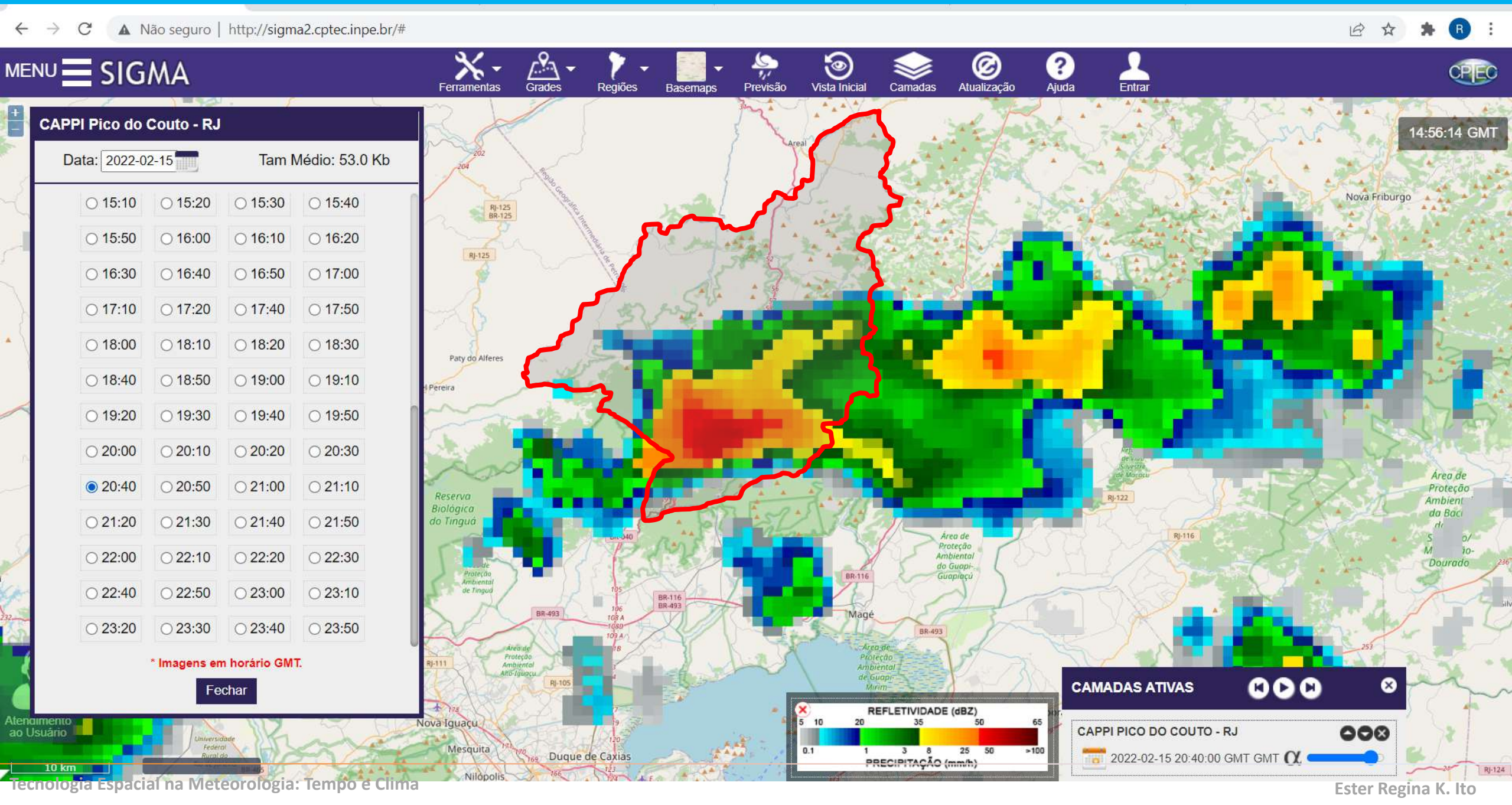


14:56:02 GMT

CAMADAS ATIVAS

CAPPI PICO DO COUTO - RJ  
2022-02-15 20:30:00 GMT GMT

# Feb 15th 2022 – Weather Radar Pico do Couto/RJ



# Feb 15th 2022 – Weather Radar Pico do Couto/RJ

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## CAPPI Pico do Couto - RJ

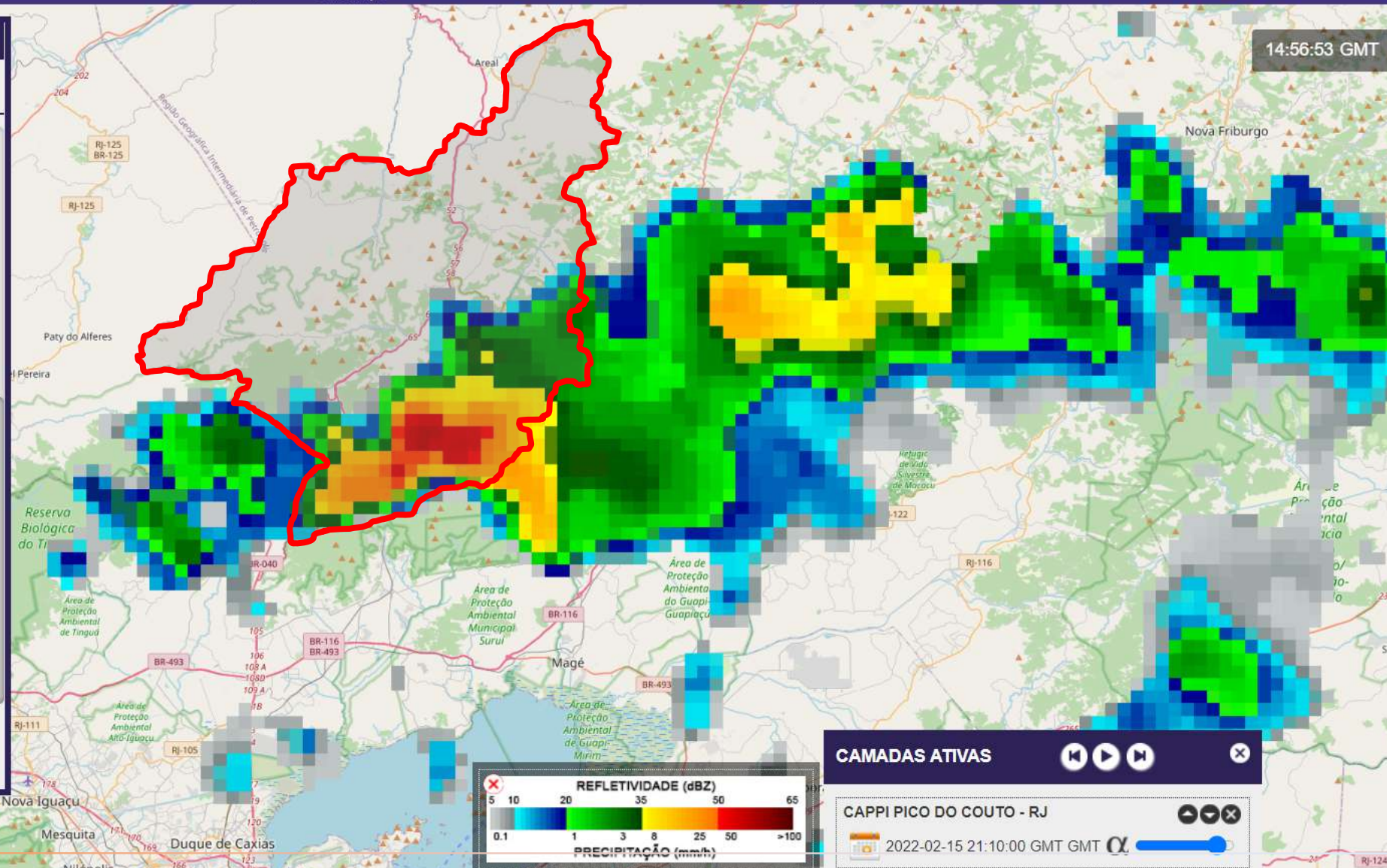
Data: 2022-02-15

Tam Médio: 53.0 Kb

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\* Imagens em horário GMT.

Fechar



14:56:53 GMT



CAMADAS ATIVAS

CAPPI PICO DO COUTO - RJ  
2022-02-15 21:10:00 GMT GMT

# Feb 15th 2022 – Weather Radar Pico do Couto/RJ

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## CAPPI Pico do Couto - RJ

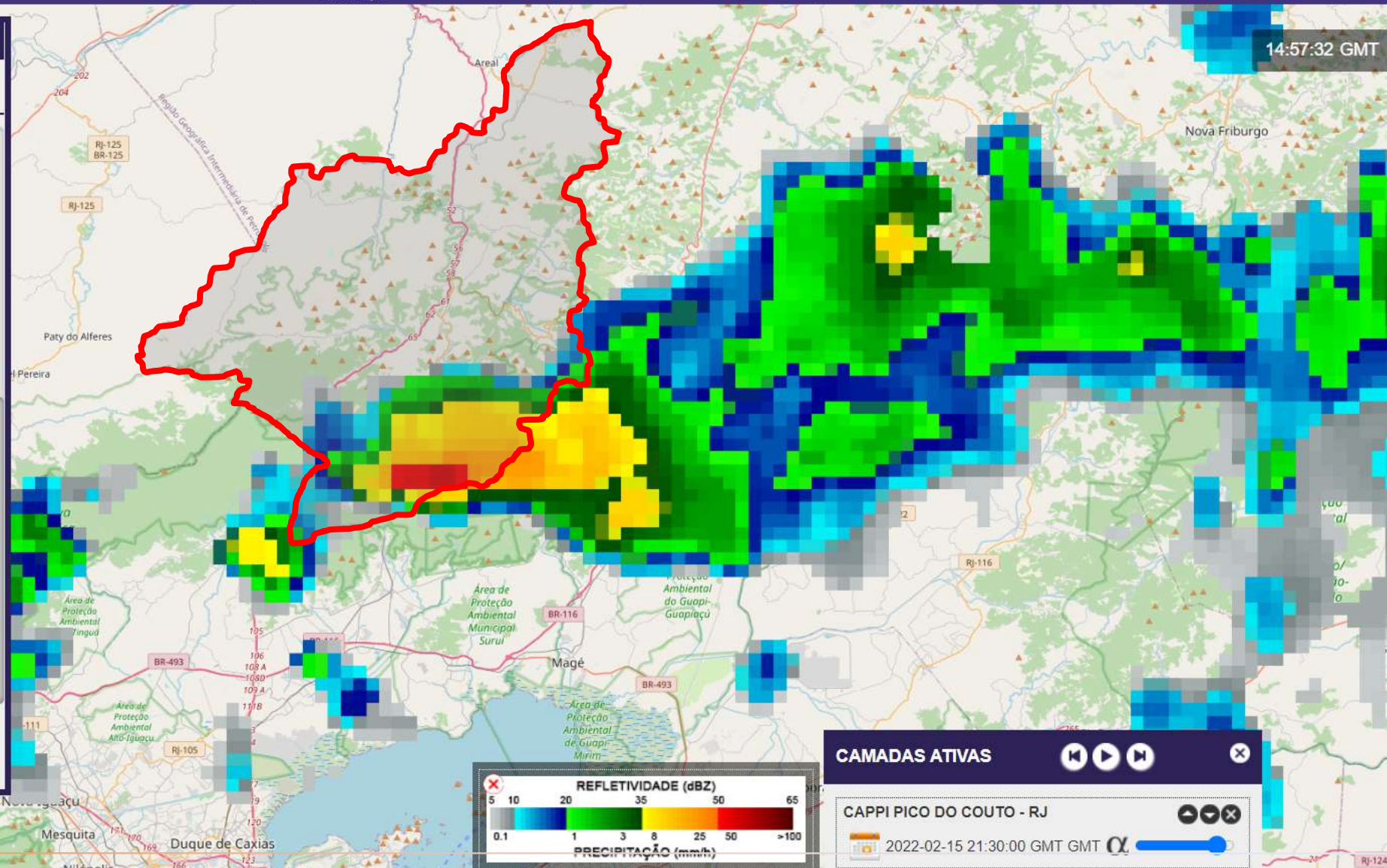
Data: 2022-02-15

Tam Médio: 53.0 Kb

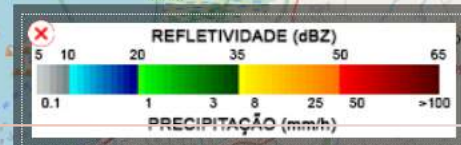
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\* Imagens em horário GMT.

Fechar



14:57:32 GMT



**CAMADAS ATIVAS** 

CAPPI PICO DO COUTO - RJ 

2022-02-15 21:30:00 GMT GMT 

# Feb 15th 2022 – Weather Radar Pico do Couto/RJ

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## CAPPI Pico do Couto - RJ

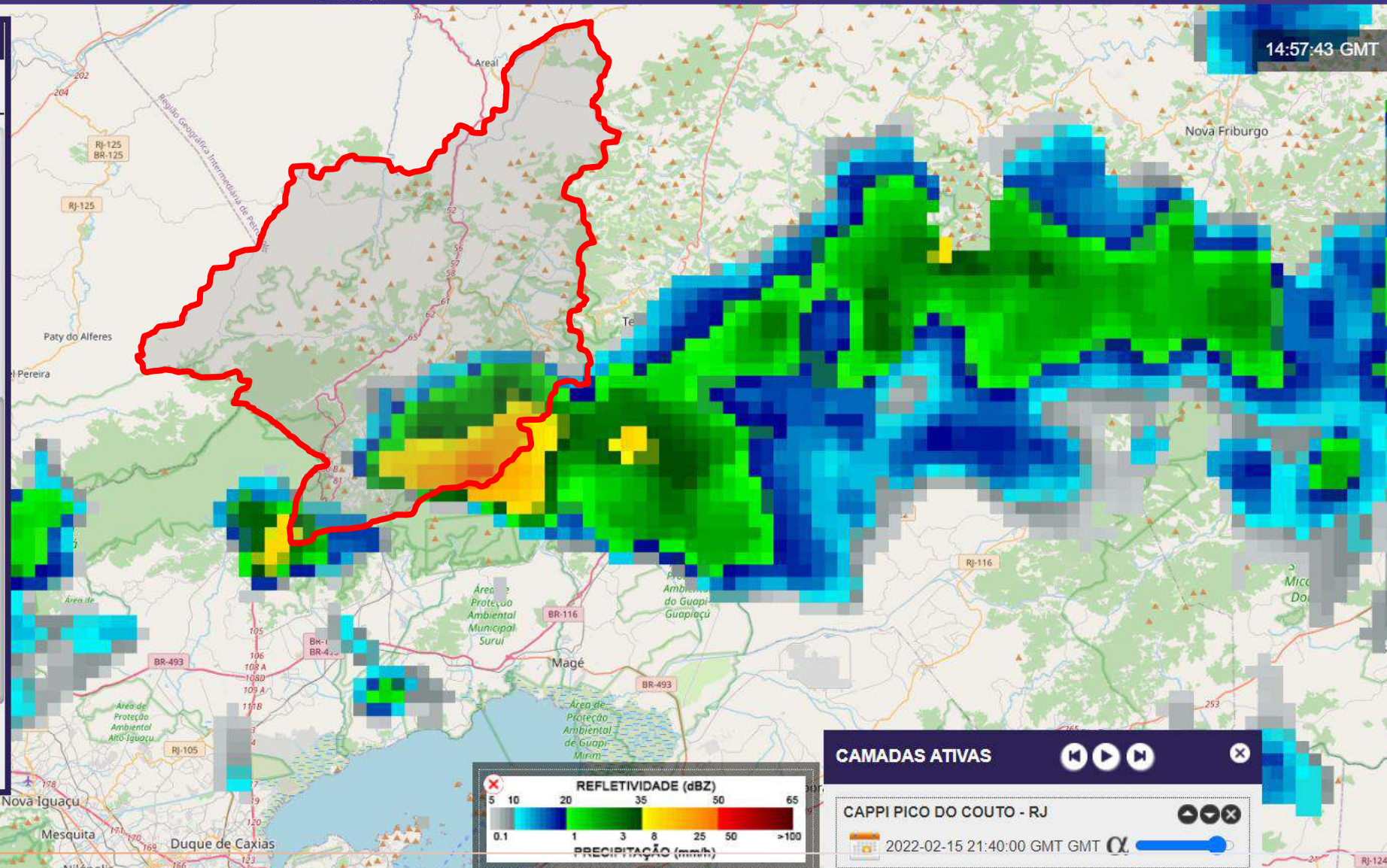
Data: 2022-02-15

Tam Médio: 53.0 Kb

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| <input type="radio"/> 19:20 | <input type="radio"/> 19:30 | <input type="radio"/> 19:40            | <input type="radio"/> 19:50 |
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\* Imagens em horário GMT.

Fechar



14:57:43 GMT

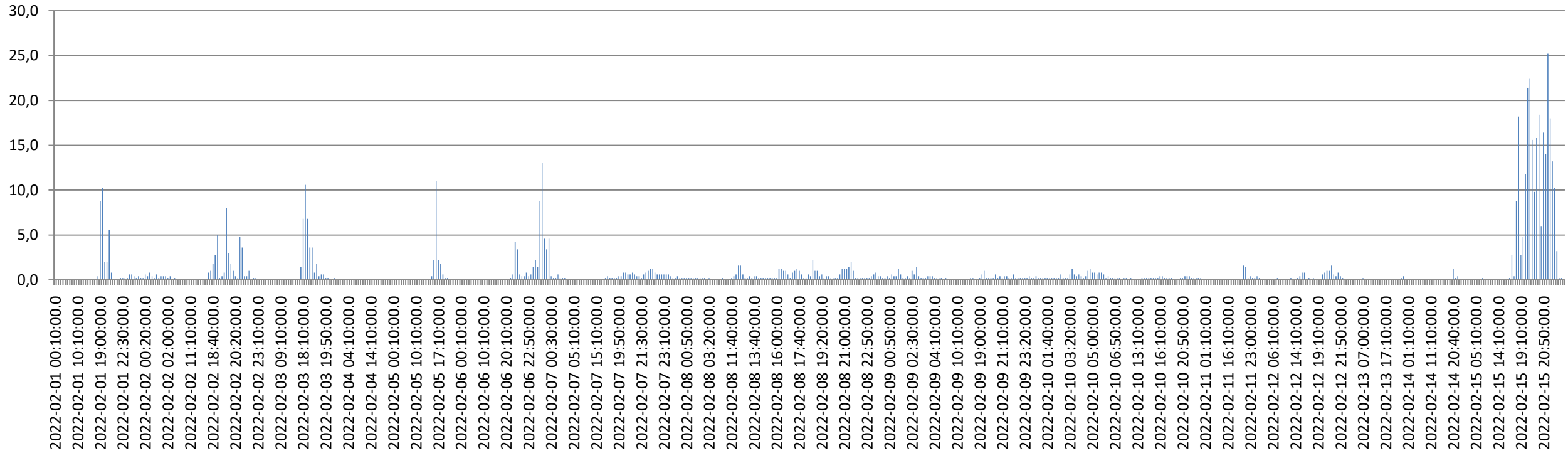
**CAMADAS ATIVAS** 

CAPPI PICO DO COUTO - RJ 

2022-02-15 21:40:00 GMT GMT 

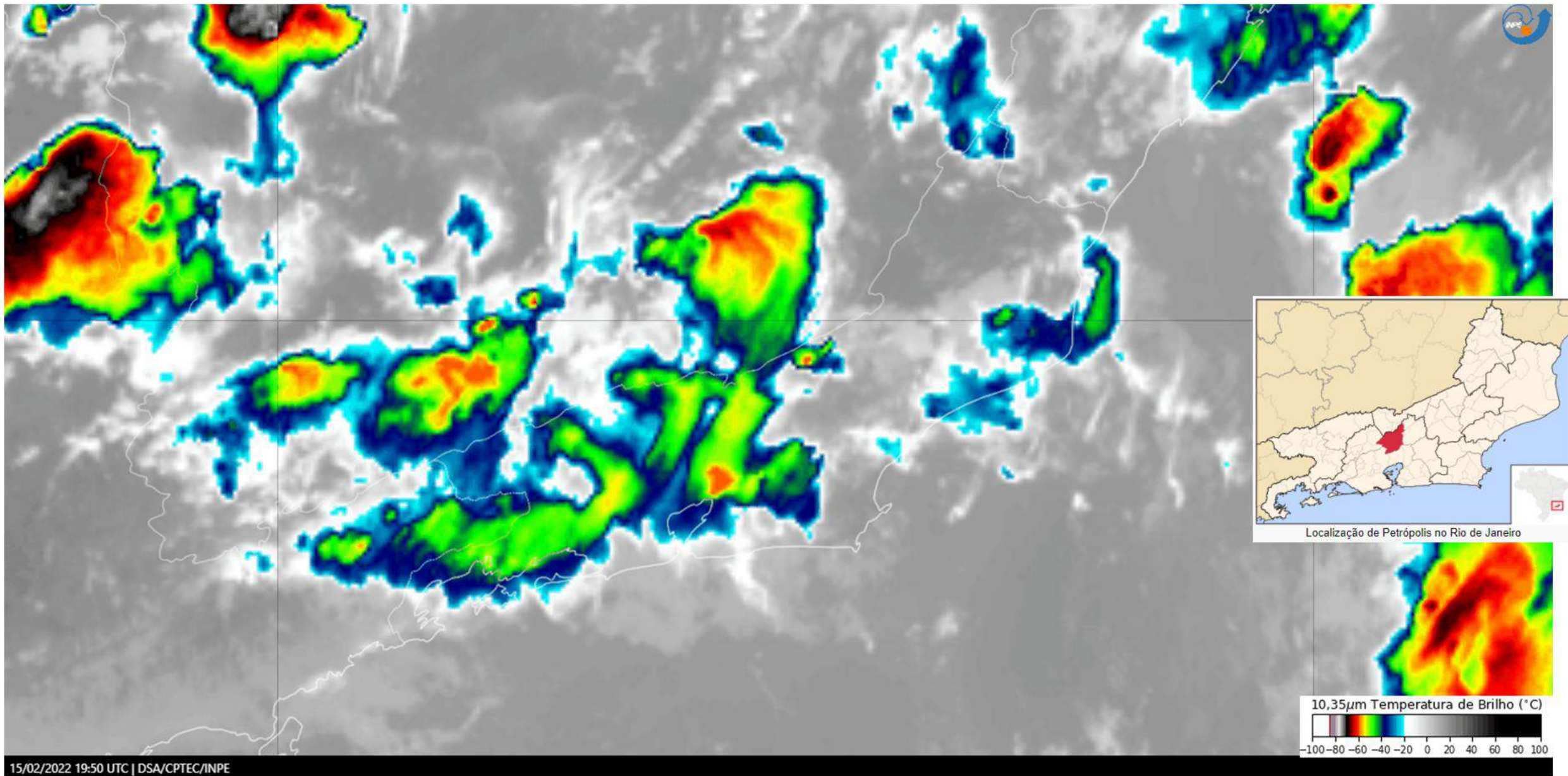
# São Sebastião Rain Gauge, Petrópolis/RJ - Feb 1 to 15<sup>th</sup> 2022

## Precipitation rate (mm/10min)



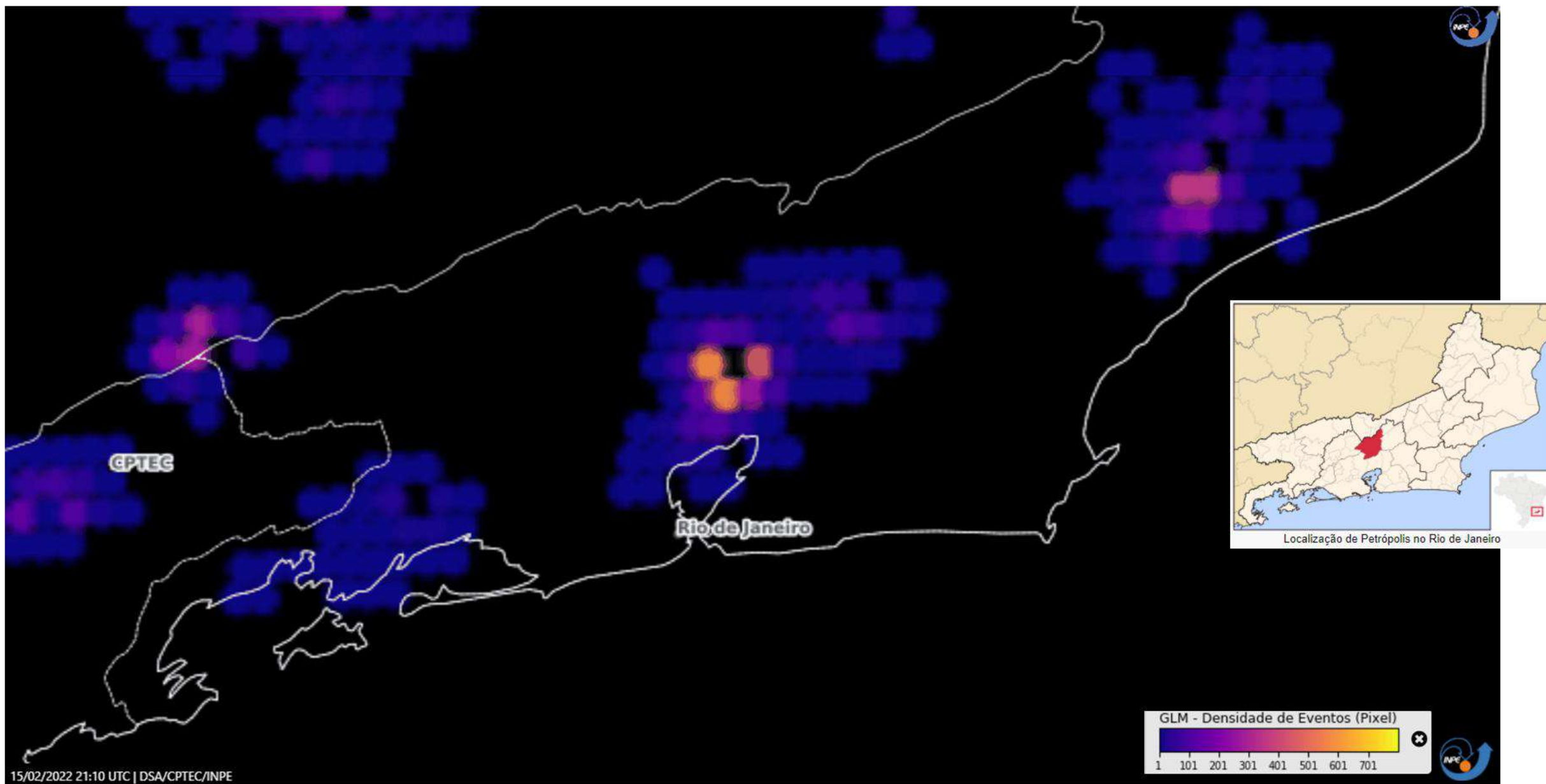
Source: Cemaden network data

# GOES-16 – ABI 10.35 $\mu\text{m}$ IR channel (NOAA)

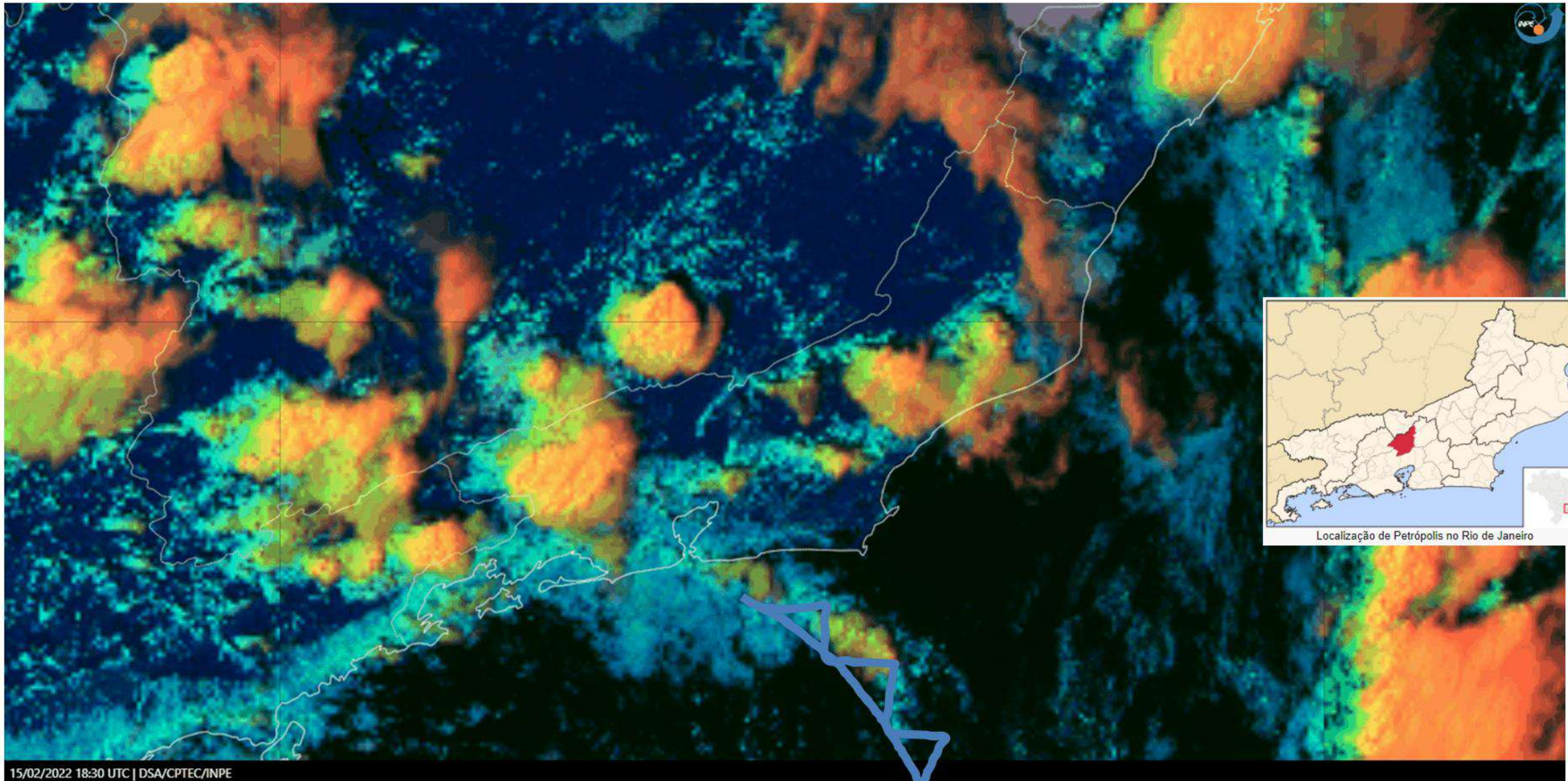




# GOES-16 GLM – Event Density



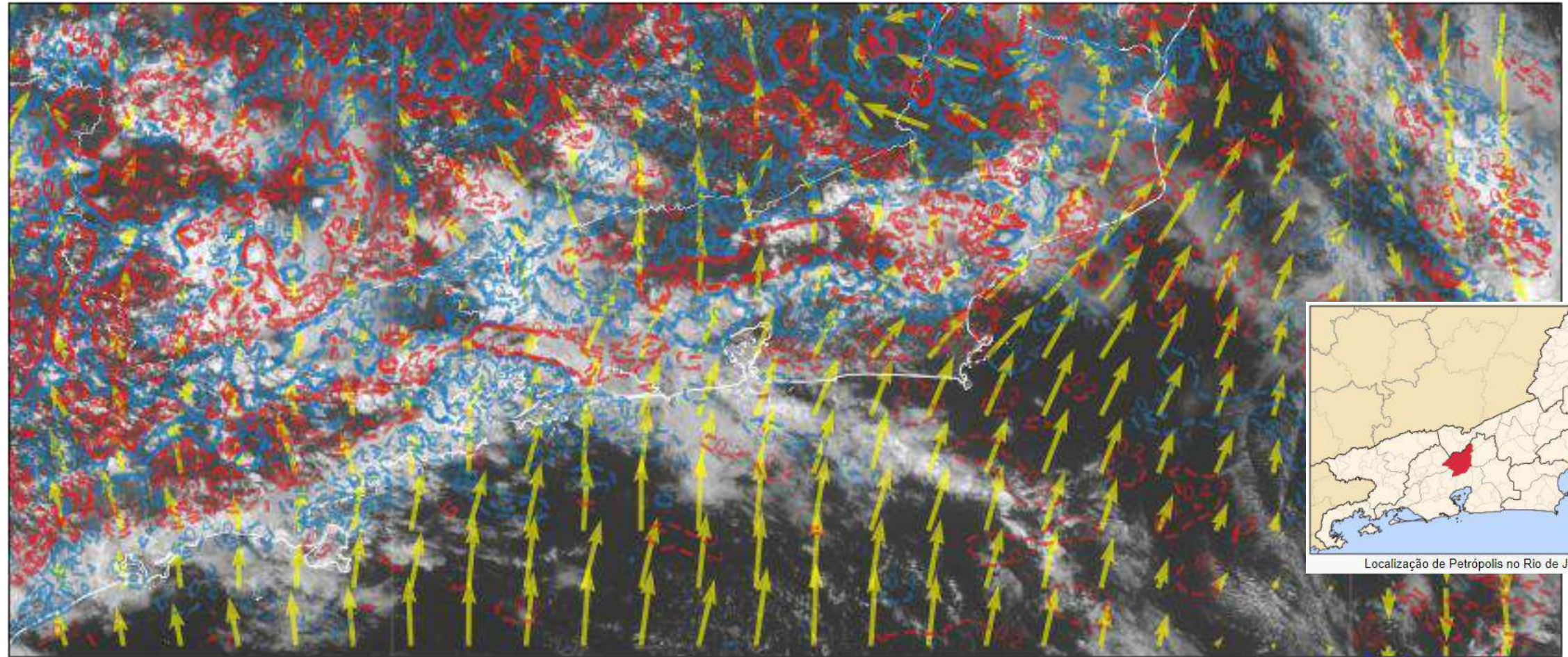
# GOES-16 – Day Cloud Distinction Phase RGB (JMA)



# ABI VIS 0.64 + WRF Model

GOES-East ABI VIS\_0.64 2022-02-15 18:00 UTC WRF: 925hPa Wind Vector + 850hPa Vert. Vel (hPa/s)

Reg.: [-47.0, -24.4, -38.9, -21.0]



# RJ Airports METAR Data - Feb 15<sup>th</sup> 2022

## Max 28 Km/h

SBSC 16000Z 16004KT 9999 SCT018 BKN100 26/23 Q1015  
SBSC 152300Z 14007KT 9999 SCT018 BKN100 27/23 Q1014  
SBSC 152200Z 17005KT 9999 VCTS SCT017 FEW035CB BKN100 26/23 Q1014  
SBSC 152100Z 17008KT 9999 VCTS BKN014 FEW035CB OVC100 27/23 Q1013  
SBSC 152000Z 16009KT 9999 SCT013 BKN060 27/24 Q1012  
SBSC 151900Z 16011KT 9999 SCT020 BKN050 28/24 Q1012  
SBSC 151800Z 18013KT 9999 SCT020 BKN050 28/23 Q1012  
SBSC 151700Z 19015KT 9999 SCT014 BKN045 29/25 Q1013  
SBSC 151600Z 19013KT 9999 SCT035 30/24 Q1013  
SBSC 151500Z 20011KT 9999 SCT030 30/24 Q1013

## Max 26 Km/h

SBAF 152200Z 24007KT 9999 SCT015 BKN060 26/22 Q1014  
SBAF 152100Z 23010KT 9999 SCT015 BKN070 26/22 Q1013  
SBAF 152000Z 24014KT 9999 SCT015 FEW030TCU BKN050 26/23 Q1012  
SBAF 151900Z 25011KT 8000 -RA BKN015 FEW030TCU BKN050 26/23 Q1012  
SBAF 151800Z 24014KT 9999 FEW020 FEW030TCU BKN050 28/23 Q1012  
SBAF 151700Z 23011KT 9999 FEW020 FEW030TCU BKN040 30/23 Q1013  
SBAF 151600Z 27009KT 9999 FEW020 FEW030TCU BKN040 29/22 Q1013  
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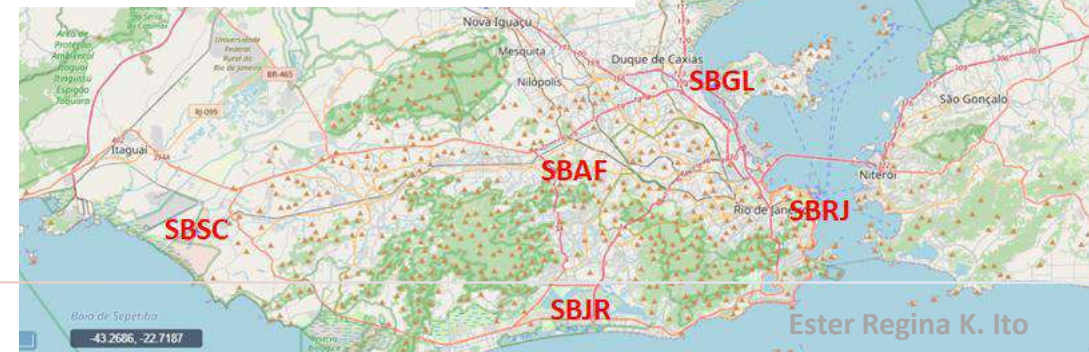
SBJR 152100Z 19005KT 9999 SCT020 BKN080 26/24 Q1013  
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SBJR 151900Z 20005KT 9999 SCT015 SCT025 BKN040 27/25 Q1012  
SBJR 151800Z 23005KT 9999 FEW013 BKN015 28/26 Q1012  
SBJR 151700Z 23007KT 220V290 9999 BKN015 SCT025 FEW030TCU 31/26 Q1012  
SBJR 151600Z 24005KT 9999 SCT025 FEW030TCU SCT100 29/25 Q1013  
SBJR 151500Z 23007KT 9999 SCT025 FEW030TCU 31/25 Q1013  
SBJR 151400Z 22006KT 9999 SCT020 30/25 Q1013

## Max 22 Km/h

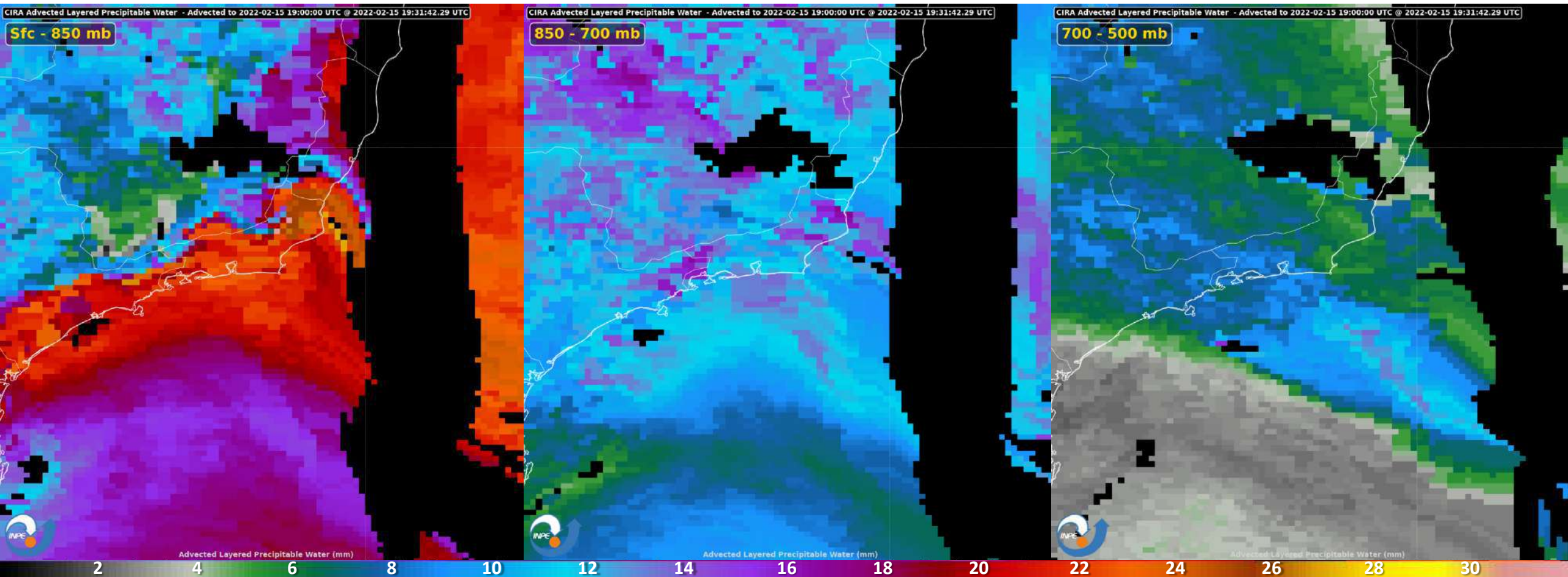
SBGL 152300Z 12005KT 9999 SCT015 OVC080 26/22 Q1014  
SBGL 152200Z 11008KT 9999 BKN020 OVC080 27/22 Q1013  
SBGL 152100Z 13008KT 9999 BKN020 OVC070 27/21 Q1012  
SBGL 152000Z 15009KT 9999 BKN020 OVC070 28/21 Q1012  
SBGL 151900Z 21012KT 9999 BKN020 FEW030TCU OVC070 29/22 Q1011  
SBGL 151800Z 20010KT 9999 BKN030 FEW035TCU OVC070 29/22 Q1011  
SBGL 151700Z 20012KT 9999 BKN030 FEW035TCU 31/23 Q1012  
SBGL 151600Z 22011KT 9999 BKN030 30/22 Q1012

## Max 28 Km/h, Gt.46 Km/h

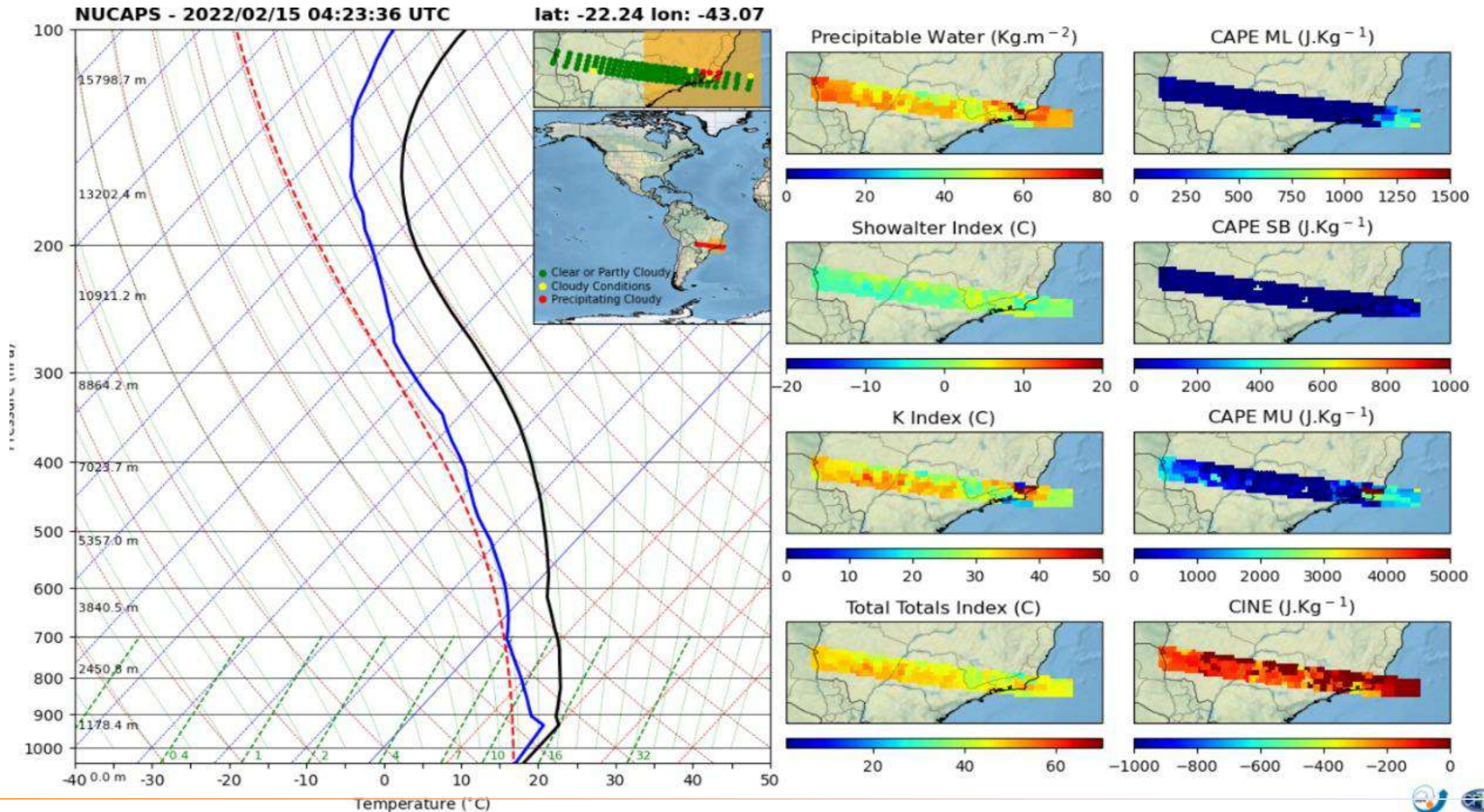
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SBRJ 152200Z 18010KT 9999 SCT018 BKN080 26/24 Q1013  
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SBRJ 151940Z 18015KT 9999 FEW013 BKN018 BKN070 27/25 Q1011  
SBRJ 151900Z 16012KT 9999 -RA BKN013 BKN020 OVC070 26/24 Q1011  
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SBRJ 151800Z 18013KT 9999 BKN020 FEW035TCU BKN070 28/24 Q1011  
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SBRJ 151500Z 20011KT 9999 SCT025 BKN050 30/23 Q1012  
SBRJ 151400Z 12006KT 090V200 9999 BKN025 28/23 Q1012  
SBRJ 151300Z 04004KT 9999 SCT020 28/24 Q1012



# Água precipitável estimada por satélite nas camadas baixa e média da atmosfera



# Perfil vertical de temperatura, umidade e índices meteorológicos, estimados por satélite



# Obrigada pela atenção!

**XXV Curso do Uso Escolar de Sensoriamento Remoto no Estudo do  
Meio Ambiente**

**14 Julho 2022, 15:00-17:00**

**Ester Regina Kazuko Ito**

**[ester.ito@inpe.br](mailto:ester.ito@inpe.br)**

**DISSM – Divisão de Satélites e Sensores Meteorológicos**

**CGCT – Coordenação Geral de Ciências da Terra**

**INPE – Instituto Nacional de Pesquisas Espaciais**